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NUMBER FIVE

POPULATION PROBLEMS IN THE
UNITED STATES AND CANADA

POPULATION PROBLEMS
IN THE UNITED STATES AND CANADA

An outgrowth of papers presented at the Eighty-Sixth Annual Meeting of the American Statistical Association, December, 1924

EDITED BY

LOUIS I. DUBLIN

Statistician, Metropolitan Life Insurance Company
President, American Statistical Association, 1924

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PREFACE

WITH all its open spaces, America has a particularly interesting and perplexing population problem which insistently bids for attention. The unparalleled growth in numbers, the intermixture of races, the rapid depletion of natural resources, the declining fertility in the cities, the urban migration, and the more recent curtailment of immigration, all make America a remarkable laboratory for the study of population. Here are combined unrivaled opportunities for investigation and unlimited possibilities for turning theories into practical channels. The subject, however, has not received the attention that it deserves from American demographers; only scattered and minor details have been explored. It was for these reasons that the American Statistical Association, at its annual meeting in 1924, devoted its entire attention to population problems. This book is an outgrowth of that symposium.

Such a volume has definite advantages. To the authority of the individual contributions it adds the freshness of varied opinion and point of view. This gain probably outweighs any loss suffered through lack of uniformity of style and of aim. No single person could, in any case, write a completely rounded work on population in the United States. There is greater hope of success through coöperation. The editor has, therefore, brought together those scientific men whom he considers qualified to make authentic statements. He has endeavored, without bias, to present all sides of the question, making no attempt to reconcile differences of opinion. There is still too much uncertainty to justify dogmatism. He takes no responsibility for the views presented; the reputation and the high standing of the individual authors assure the reliability of their data.

Only those topics which are now arousing most public interest were selected. The recent changes in our immigration laws, for example, focused attention upon the racial composition of our population, the innate ability of the various peoples, and their contributions to American life. The War and the many changes in industrial organization growing out of it emphasized anew the problems of our labor supply, including the employment of women and children, the standard of living, the rate of wages, the effect of health activities on the constitution of future populations, the exploitation of our natural resources and the drastic program of conservation which their depletion has necessitated. It appeared to the editor that the treatment of these topics would result in an instructive volume, even if the more abstract and theoretical phases of the subject were omitted.

Lack of data accounts for the sketchy treatment of several sections. All birth and death figures relating to periods prior to the beginning of the present century are conjectural, and the vital statistics of the country are still very inadequate. Even to-day there are large and important sections outside the Registration Area. There exists virtually no information on the fertility of our people; on the comparative fertility of different race-stocks in the United States, and on the effect upon fertility of residence in this country; on the size of families; and on the duration of marriage. Statistics of migration are inadequate, not only concerning movements of various nationalities to and from the United States, but also concerning border and internal migrations. There is need as well of estimates of National wealth prior to 1850, and an official price index to be used in reducing estimates of wealth, currency, and taxation to a common level of purchasing power. Further information is also needed regarding individual incomes and earnings, occupations, agricultural resources, crop production, land rents, land values, and the comparative results of various methods of cultivation.

Our contributors have been wary to commit themselves on the ultimate limits of the American population. Just as it was impossible, at the opening of the nineteenth century, to predict the population increases of the next hundred years, because of the changes effected by the Industrial Revolution, so it seems equally hazardous at this moment of rapidly changing world conditions to estimate the population of the United States at any distant date. Prophecy is at all times dangerous, especially so in view of our lack of basic data and the imminent possibility of fundamental discoveries in agriculture or in the production of synthetic foodstuffs. Every one realizes, moreover, that the knitting together of the countries of the world by vastly improved methods of communication has made the whole world a unit and has given the population problem of each country an international aspect. This linking of countries and the close interrelationships that it has brought may ultimately necessitate a liberalizing of our immigration laws. At all events, only through amity and coöperation between nations can the population problem of any individual country be solved. These newly emphasized interdependencies of the peoples of the earth make it more difficult than ever before to determine the limits of population in any country.

There is no attempt in this book to speak with finality. Our purpose is to bring out some of the more insistent social and political phases of the population problem, to stimulate a research attitude on the part of our citizens, and to encourage a more dispassionate basis of judgment among American legislators. Any National program must be flexible and easily modified to suit changing conditions. We have emphasized the necessity for further investigation and for the collection and analysis of additional data. We hope that these papers may be instrumental in replacing the prevailing unscientific and almost arrogant attitude on population questions in the United States with a spirit of scientific investigation and an understanding of the value of racial backgrounds differing from our own, which may lead eventually to a practical and liberal population policy.

The editor acknowledges his indebtedness to his associates in the preparation of this volume. They have been coöperative and patient. He is especially under obligation to Miss Bessie Bunzel, of his own office, who has carried the brunt of the work both in the arrangement of the program and in the preparation of the volume for the press. But for her assistance, this book would not have been possible.

LOUIS I. DUBLIN

NEW YORK CITY
December, 1925

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POPULATION PROBLEMS

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PART I

INTRODUCTION

POPULATION PROBLEMS

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CHAPTER I

THE STATISTICIAN AND THE POPULATION PROBLEM

By LOUIS I. DUBLIN

Statistician, Metropolitan Life Insurance Company

The population problem is to-day one of the most vital in American life. It interests the statistician professionally; it affects every intelligent citizen. Perhaps no other subject has greater national and international significance, nor has any other developed such a variety of opinion or aroused greater antagonisms and prejudices. The World War was essentially an outgrowth of a pressing population problem which confronted the nations of Europe ten years ago. The peoples of Central Europe were overcrowded. Each country needed room for expansion and desired additional markets and colonies where surplus peoples could be accommodated and food could be raised for the use of the homeland. Germany more than any other country was striving for a place in the sun, and found her borders shadowed on the one hand by France and on the other by Russia. To make matters worse, she felt a sense of superiority to France, whose population she had far outstripped in numbers. The year 1914 seemed an opportune time to strike for more territory. The fears engendered in France and Russia by an ever-growing Germany contributed to a state of mind which made war inevitable. This is an outstanding example of an almost universal condition. In the Balkan countries, the same situation prevailed; each dreamed of a greater Greece, or Bulgaria, or Roumania, as the case might be, a dream which could be realized only at the expense of a neighboring country. In Japan, the intense pressure of the population on the island kingdom accounts for its desire to spread out to unsettled areas near at hand and to seize opportunities for migration to America and Australia. This has produced hostile reactions and closed doors against the Japanese, in Australia, the United States, and South America. The mistrust thus aroused is responsible for the rapid growth of the war spirit.

These are instances of the sinister international aspect of the population problem. Within individual countries, also, exaggerated nationalism and exclusiveness result from the pressure of population. The psychology which they have engendered in the United States has given rise to two movements: the Ku-Klux Klan and the new immigration policy. Both express the point of view of a great mass of native Americans in all parts of the country, which may be summed up in the slogan, 'America for Americans.' What underlies these phenomena is, first of all, a distrust of the newcomer, resentment at his success, and the fear engendered by his greater fertility and rapid increase in numbers after his arrival. The adherents of the Klan see themselves losing control of the country. Their formation of an organized group, then, is really a defense reaction to the passing away of power from their own hands into those of aliens whom they consider inferior or, in any case, unable to conduct the affairs of the country. Essentially the same reasoning is at the bottom of the new immigration law, which admits into the country only a limited number of aliens, selected from the few countries whose peoples and standards of living most closely resemble our own. The organized propaganda for the Nordic races in America is simply an effort to clothe a fundamentally unreasoning prejudice with respectability and an appearance of scientific logic.

Such sentiments and passions often lead to hastily considered legislation. Laws not based on accurate information or rational deliberation are passed, only to be repealed after irreparable damage has been done. Had the statistician been consulted in the first place, much of this futility could have been averted. His function is primarily to get the facts, to analyze them, to weigh their relative importance, and then to arrive at a conclusion based upon the evidence. From the beginning, the study of population has been the statistician's special concern. In fact, he made his first real contribution in this field and thus earned his name. For was not the 'Statist' at the end of the eighteenth century the man who concerned himself with the affairs of the State, who made inquiries respecting the population, the production, and the resources of the country, who recorded and organized available knowledge describing the human beings of the State? If our intricate social problems have a solution, the statistician above all others should be qualified, after two centuries of study, to make a contribution of the first rank, and to introduce order, logic, and understanding where now only confusion reigns.

The population question, important everywhere, is to-day most pressing in the United States. It is acute enough in the countries of Europe and Asia; but there the issue is clearer, because those parts of the world have virtually reached a saturation point, and in most cases possess a population fairly homogeneous as regards blood and culture. It is not too much to say that the hope of the world rests on a happy solution of our population question. Since Canada, Australia, and the South American States are facing much the same problem, any conclusions we may reach will be of great value to them also.

The population problem of the United States has two main aspects, the first quantitative, and the second qualitative. A knowledge of the first includes an understanding of the facts of our population from the point of view of both structure and movement, in the past and currently. It involves a consideration of the possibilities of future growth; the determination of the maximum numbers which can be supported, and the date at which this figure is likely to be reached. We must discuss, likewise, the relationship between the growth in numbers and the changing natural resources of the country — agricultural, mineral, and littoral. These factors are all considered in Parts II and III of this book.

The second, or qualitative, aspect has to do with such factors as the present racial constitution of the country, the contribution which the various stocks have made to our common culture, and our attitude regarding the future composition of the country. This involves, in Part IV, the discussion of a rational immigration policy.

There are other important factors, however, which are neither exclusively quantitative nor qualitative in character, but which partake of both these characters. Our future well-being will depend on the standards of living we desire, on the efficiency with which we manage our resources, and on the adequate training and the effective direction of our labor supply, with due regard to the utilization of the labor of women and children. These questions are considered in Part V.

And finally, in Part VI, we shall seek to formulate a program, outline a technique, and present a goal for the future. We shall attempt to sketch the type of civilization that we may hope to achieve; its internal economic and social organization; the composition and organization of the family unit. We must endeavor to understand how the age at marriage influences the size of the family; the part played by schooling and training; what conditions best enable the individual to cope with his environment; what vocational equipment is necessary; whether the public health movement and the improvement in environment have contributed to an increase of weaklings; whether our vast system of poor relief has served only to provide a cheap, but inadequate labor supply.

The population problem still involves many uncertain factors. At any time the results of chemical experiments may provide us with the means of producing synthetic foodstuffs in the laboratory at a speed which would make us independent of the slow growth of Nature; or the physicist may furnish new sources of energy, or new methods of bringing available energy to bear upon vital processes, so as to multiply by a large factor their ordinary rate of growth. Such developments as these may revolutionize our whole social economy and knock into a cocked hat all previous estimates of an optimum population. At all events, the subject has not yet reached a point where definite laws can be established.

A few comments on methodology may serve to coördinate the many-sided discussion which follows. The first warning is against the danger of generalizing from crude and temporary relationships. A number of statisticians have assumed that the future growth of the United States will maintain the same pace as in past decades; they have failed to give due consideration to the underlying factors which have caused that increase. This has led them to forecast future populations of enormous size, which at an early date would tax the limits of our natural resources. No wonder that they are pessimistic and urge the most drastic limitation of immigration and restriction of our fecundity. What items have they overlooked? Professor Willcox, from a critical analysis of population statistics, infers that a natural decline in the native American birth-rate began as early as 1812 and that it has continued since that time.[1] At any rate there has certainly been a long-continued decrease. This declining native birth-rate has received very little attention, its effects having been obscured partly by the reduction in mortality, and partly by the phenomenal immigration movement of the last fifty years.

The great increase in numbers during this half-century has resulted largely from immigration. Since 1900, well over 16 million foreigners have come here, the gross immigration averaging over a million each year for the five years ending June, 1914. Furthermore, they have come from fertile peoples, accustomed for centuries to large families; and since for the most part they enter the country during their reproductive years, they propagate freely. In 1920, the foreign-born whites constituted 13 per cent of the population; the native-born of foreign parentage, 14.8 per cent; and the foreign-born of mixed parentage, 6.6 per cent. This makes the foreign stocks in 1920 over one third of the population.

To-day, the picture is on the way to being completely changed. On account of recent restrictions on immigration, our future increases of population will have to come almost entirely from the excess of births over deaths among the native-born; and if present indications are any guide, the phenomenal growth of the past will never be repeated. In 1920, the native stock residing in the urban areas, the country over, was scarcely replacing itself. There are also clear indications that among the foreign stock the size of the families varies inversely with the length of time they have lived in the United States. With immigration restricted, every existing population forecast must be revised with due regard to the relative fecundity of stocks now in the country. We shall, indeed, be confronted with the reality of a stationary population much sooner than any of our forecasters have imagined.

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[1] Walter F. Willcox, 'The Changes in the Proportion of Children in the United States and in the Birth-Rate in France in the Nineteenth Century,' *Journal of the American Statistical Association*, March, 1911; pp. 449–99.

The next warning is against the illusion that we shall presently find an easy solution of the population problem. Those who have been most distressed by our rapid increase in recent decades have, for the most part, urged the more general practice of birth-control, which has seemed to them the easiest and most direct way out of our trouble. The assumption seems to be that birth-control is a new influence which would substitute order and intelligence for the present haphazard and indiscriminate growth of population. But the facts appear to be otherwise. The practice of birth-control is not new. It has been for years, and is increasingly to-day, the practice among city dwellers who belong to the salaried classes; nor has it been limited to this group. In no other way can we account for the rapid decline in the birth-rate in the United States and other countries. Only fifteen years ago the birth-rate was near 30 per thousand in those cities of the United States which kept accurate figures. Now it is little over 20. This amounts to a drop of 30 per cent during a period of generally increasing prosperity, of rising wages, and of other favorable factors which ordinarily increase the birth-rate. Every doctor, every nurse, and every social worker knows how powerful is the influence of birth-control at the present time. The researches of Katherine B. Davis, of J. McKeen Cattell, and of others demonstrate this. Birth-control must, therefore, be considered frankly and fully, and its effects should be carefully weighed before it receives further sanction from presumably authoritative sources.

The recent changes in our immigration laws on the one hand and the practice of birth-control on the other will very soon produce a situation essentially different from that of the previous generation. We must be prepared at a comparatively early date for a stationary population, unless we completely change our present attitude toward the foreigner and modify our approval of small families. Such a reversal is not probable, because as a nation we like to indulge our sense of exclusiveness and superiority. Moreover, since giving birth to a very few children apparently offers many personal advantages, it appeals to the average family, which is more concerned with immediate increase of comfort than with abstract principles of obligation to country or to mankind in general.

It will clarify our discussion at this point if we consider the number of births required, under present conditions of mortality, to keep a population stationary. According to the mortality and marital conditions prevailing in 1920, out of every thousand females born, 788 will eventually marry. In other words, we must count on 788 married women to give birth to one thousand daughters in order to replace the thousand from whom they sprang. To put it another way, each thousand married women must have 1268 daughters to replace themselves under present mortality conditions. Likewise, each thousand married men must be the fathers of 1350 sons in order to replace themselves. Combining our figures, we find that

1000 families must, on the average, have 2618 children, or each family must, on the average, produce 2.6 children, to replace the original quota from which the parents sprang. Not all families, however, have children; at the present time about one marriage in six is either sterile or does not lead to living issue. The burden of child-bearing falls, consequently, on the remaining families, who must bring into the world an average of not 2.6, but 3.1 children. The family unit, therefore, must average 5.1 persons, including all the children born to fertile mothers, not merely the children living at any given moment. All groups of urban families in the United States recently studied have shown that the average number of children born to a completed marriage is barely sufficient to maintain a stationary population. It is only when the rural areas of the country are included that the figures show any substantial natural increase.

Dr. Lotka and I, in a recent excursion into this field, have uncovered a number of highly interesting and even astonishing situations. As the result of the higher birth-rates of past generations, there is at the present time an abnormally large number of persons at the reproductive ages of life; and this tends to increase the current birth-rate. We have calculated what the present birth-rate would be if the age distribution at the reproductive ages were the result of a prolonged continuation of our present rate of procreation (that is, births per annum per potential mother of a given age). The effect would be to reduce the figure from 23.4 per thousand, the present figure, to 20.9. In other words, what for the time being maintains our birth-rate is not our inherently high reproductive vitality, but rather the fact that the surviving descendants of a more highly reproductive generation are to-day swelling the ranks of middle life and participating in parenthood. They thus lend a spurious appearance of vigorous growth to an otherwise meagerly reproducing population. A second result of this padding is to reduce the death-rate disproportionately, because the ages of early adult life have very low mortality rates. If correction were made for an age distribution on the basis of the present life table and the present rate of procreation, the death-rate, instead of being 12.4, as it is now, would become 15.3. The effect of these two corrections would be to reduce the rate of natural increase from 11 per thousand to only 5.5 per thousand; that is, to reduce it to half its present value. This means that, aside from the transitory benefits of past high birth-rates, we are actually increasing at the rate of only 5.5 per thousand per annum, instead of 11 per thousand per annum.

Equally interesting is the result of our investigation into the effect of the recent reduction of mortality. The last five or ten years have seen a marked diminution in mortality rates, which has had the effect of increasing the rate of natural increase. If we should calculate the rate of natural increase of our population at our present rate of procreation and at the mortality rate of 1910, the result would be a rate of natural increase per annum of only 3.6 per thousand; and if we should go back to the mortality conditions of 1901, the present rate of procreation would barely keep us from the down-grade. With the rate of natural increase reduced to virtually zero, we should then have the condition of a stationary population. Thus it appears that we are protected from a period of actual decline by a narrow margin of only ten years' gain in our surviving rates. These figures show how close to the danger line we now are.

We must exercise particular care, as we approach the point of a stationary population, not to weaken its internal composition by increasing the proportion of defective stock. This is all the more important because a stationary population inevitably contains a relatively greater number of older persons than does a growing population. Since the burden of supporting the advanced-age groups falls in part upon the young people, they must face the prospect of carrying a greater burden than has fallen to the share of young people in the past. We are here confronted with a vicious circle; for the greater the burden placed on young people, the fewer will be their children, and this will mean still fewer young people at the reproductive period in the next generation. If a population can increase in a geometric ratio, it can also decrease in the same ratio. This is a very real danger.

Probably nothing that we can do will alter the tendency among the great mass of Americans to limit the size of their families. Reproduction will hereafter be regulated more and more by intelligence and restraint. Excessive breeding should receive scant approval anywhere. We must aim at this time not for numbers at the expense of quality; but must rather seek to develop a well-organized and happy society. That is the objective which should animate every student of population, every statesman, and every thoughtful citizen. We must be careful, however, about the way we take to arrive at this goal. Merely wiping out our natural increase by the first means at hand will not do it. We must not substitute real and serious new troubles for minor and even imaginary old ones. Above all, we must not forget that population mistakes are not easily remedied; once they are made, and their effects have become visible, it is usually too late to correct them.

A third suggestion toward a unified theory of population is that our approach be democratic and not aristocratic. It has been fashionable in recent years to lament the non-fertility of the native stock and the fecundity of the newcomer. It has been assumed that the older races, and especially those of Nordic origin, are innately superior. Leaving aside all discussion of the contributions which the various race stocks have made, I would caution against the too ready acceptance of a theory which establishes sharp class distinctions without sufficient scientific proof. Certainly, at the present time, evidence is hardly sufficient to warrant the sweeping conclusions so often made that certain racial elements in our National life are vastly superior to others.

Reflecting the aristocratic bias is the current view, especially pronounced among a number of biological writers on population, that the country is headed for disaster because of the greater fertility of the 'masses' as contrasted with that of the 'classes.' The literature associated with the eugenic movement has overstressed the dangers implied in the differential birth-rate. 'Beware of reproducing from mediocrity,' is the warning. There is often a thinly disguised plea for a race of supermen who, presumably, could spring only from the upper social and economic strata. The common man has little place in this scheme of things, although he does, after all, make up the bulk of the population. This basic assumption should be thoroughly tested, even though its acceptance does flatter our self-esteem and reflect the paganism of our times. Its chief defect lies in its almost total disregard of the influence of environment and tradition on our conduct and achievement. It is, moreover, a direct challenge to our best ideals of democracy and religion. When we have eliminated the upper and lower 10 per cent of our population, there is not sufficient indication of serious differences in innate ability among the remaining

80 per cent to justify the current warnings against their deliberate participation in parenthood. They are neither spectacularly fit nor unfit. If they lack the brilliance which would single them out for special distinction, they usually have other compensating, valuable, and attractive qualities. They are just plain folks, carrying on the world's work. We see on all sides clear evidence of the ability of ordinary people to give birth to children capable of the highest achievements as opportunity and environment release their power. Our social organization, by its very complexities and the perfection of its mechanical foundations, is conducive to stimulating the innate abilities of men from all walks of life, which in a less well-organized society might go to waste. Throughout all ages the leaders of mankind have come predominantly from homes which at first sight seemed most unpromising and commonplace. Will not the leadership of the next generation come, as it always has in the past, from that source?

For these reasons the newer tendencies and movements in the American population are by no means inimical to our institutions and to our best traditions. If we control, or better yet entirely check, the reproduction of the obviously unfit, we are in no danger of racial deterioration. There has always been a differential birth-rate and a replacement of one group of people above by another, equally good, from below. In all ages, men have raised themselves above their inherited station in life and have occupied the seats of the mighty, left vacant by those considered their superiors, who have neglected or have been incapable of performing their highest obligation to society, namely, parenthood. In all fairness, we must critically examine the current point of view and shift the emphasis in our population discussion from a glorification of the upper strata to a more generous recognition of the inherent worth of the great mass of mankind.

PART II

STATEMENT OF THE PROBLEM

CHAPTER II

POPULATION GROWTH IN THE UNITED STATES

By E. B. REUTER

Professor of Sociology, University of Iowa

An understanding of the rate and trend of population growth is necessary to serious consideration of questions centering about the quality of human groups and their social and economic welfare. An increase in population is, in general, due to a difference between the birth-rate and the death-rate. But the effects of genetic increase are modified by emigration and immigration, which change not only numbers but also rates of increase through the introduction or departure of groups with characteristic fecundities. Growth in numbers and the rates of growth are also modified by changes in political boundaries and enumeration areas.

The practice of making periodically an accurate enumeration of population was not generally considered a proper function of government before the nineteenth century. There were, of course, various earlier population counts, made at irregular intervals and usually for limited and special purposes; but with the exception of Sweden no country had undertaken complete and periodic censuses of its population prior to the beginning of the Federal system in the United States in 1790.

During the entire Colonial period of over a century and three quarters, there was no comprehensive enumeration of the population. There were a number of partial censuses, some of the Northern Colonies making several separate counts, but in other Colonies no reasonably accurate counts were ever made. In the Colonies where censuses were taken, the enumerations were at irregular intervals, hence not directly comparable. Moreover, because of sparsely settled territory, the use of unpaid enumerators, and the prevailing superstition that the numbering of the people would be followed by disease epidemics, the returns were incomplete and in general highly inaccurate.

Nevertheless, these partial enumerations, fragmentary and disappointing as they are, when supplemented by historical and statistical information gleaned from contemporary estimates, poll-lists, military rolls, journals, letters, official papers, and other sources, disclose with approximate accuracy the number of persons in the country at all times since the planting of the Jamestown Colony on the Virginia coast. It is true that our figures for the Colonial population are in nearly every case merely estimates. But they are estimates based upon all the information now attainable and they represent the best judgment of the historians and statisticians who have interested themselves in the problem.

In 1610 the Virginia Colony, with a total population of 210 persons, began the English settlements on the Atlantic seaboard. At the close of the first ten-year period, the American population numbered approximately 2500 persons, an increase of 1090 per cent. At the close of the second decade of American Colonial history the number had grown to 5700, a percental increase of 128.1 for the decade. The third decade reflects the increasing control over a still largely unexplored continent: in 1640 the total population numbered approximately 28,000 persons, a percental increase of over 390. In the following ten-year period the population showed an increase of 85 per cent; and in the fifth decade, ending in 1660, the increase was 64 per cent.

COLONIAL POPULATION WITH DECENNIAL INCREASE

YEAR	POPULATION NUMBER	INCREASE OVER PREVIOUS DECADE (per cent)
1610	210	......
1620	2,499	1,090.0
1630	5,700	128.1
1640	27,947	890.3
1650	51,700	85.0
1660	84,800	64.0
1670	114,500	35.0
1680	155,600	35.9
1690	213,500	37.2
1700	275,000	28.8
1710	357,500	30.0
1720	474,388	32.7
1730	654,950	38.1
1740	889,000	35.7
1750	1,207,000	35.8
1760	1,610,000	33.4
1770	2,205,000	37.0
1780	2,781,000	26.1
1790	3,929,625	41.3

It is obvious that the percentages for these first decades have no significance as indications of normal population growth. In the early years numbers were so small that the arrival of a shipload of colonists was a notable event. Yet, in spite of the high percentage increase from decade to decade, the growth in numbers was slow. People hesitated to face the uncertainties of a new land and the rigors of frontier life. Failure to find gold and silver, tales of hardship and suffering, and religious intolerance in certain Colonies tended to retard migration. The immobility of labor in the seventeenth century, the expense of emigration, and the opposition of the British Government to emigration were important factors in the slow growth of the Colonial population.

By 1660 the population had reached approximately 85,000, a number which was not greatly affected by the relatively small number of annual arrivals, and this stability increased in the succeeding decades. As the conditions of Colonial life became easier, as dangers and discomforts diminished, as religious intolerance abated, and as letters from America became more cheerful, migration became continuous. But as the population grew, the natural increase assumed a more and more important rôle in determining the rate of growth and in maintaining a rapid, stable, and uniform rate of increase. The life was rough but comparatively easy. There was an abundance of free land and the cost of living was low. The age of marriage was young and families were large. The growth of population was rapid and fairly uniform.

The per cent increase for the decade ending in 1670 was 35, which rate continued without violent fluctuation throughout the remainder of the Colonial period. Only once, during the decade of the Revolutionary War, did the rate of increase drop below 30; and only once, during the decade following the Revolutionary War, did it rise above 40.

From the beginning of our National life to the period of the Civil War, the rate of growth of the National population was fairly uniform, remaining roughly that of the one hundred and fifty years preceding. The following table shows that in the years from 1790 to 1860 the population doubled in each twenty-five years:

The conditions of life basic to population growth underwent no great change during the seventy-year period covered by these figures. The Malthusian checks were inoperative; economic conditions tended to encourage, rather than discourage, reckless multiplication. Land was plentiful and virtually free. The organization of life was simple and largely rural. The rearing of a large family was not a serious economic burden. The hedonis-

INCREASE IN THE POPULATION OF THE UNITED STATES AND ESTIMATED RATE OF INCREASE, INDEPENDENT OF EMIGRATION AND IMMIGRATION

Census Decade Ending	Total Increase (per cent)	Estimated Natural Increase (per cent)
1790	....	....
1800	35.1	....
1810	36.4	....
1820	33.1	....
1830	33.5	31.8
1840	32.7	27.7
1850	35.9	25.3
1860	35.6	22.8
1870	26.6	18.5
1880	26.0	19.0
1890	25.5	16.3
1900	20.7	15.2
1910	21.0	13.2
1920	14.9	10.9

tic side of life was undeveloped and did not compete seriously with the simple pleasures of home and family. The population was extremely pious. The spirit of the times was optimistic. Early marriage and large family were in the *mores*, and there was little information current concerning methods of contraception. All the factors, subjective and objective, necessary to population increase at the barbarian rate were present. Reproduction was virtually unrestricted and natural increase was limited only by the excessive death-rate which accompanies an excessive fecundity.

The rate of growth of the American population, roughly a doubling in each twenty-five-year period, which had prevailed for approximately two centuries, was violently disturbed in the decade of the Civil War. Immigration was sharply checked. The mobilization of the Nation's man power and the material increase in the death-rate incident to war affected directly the marriage-

and birth-rates. From a percental increase of 35.6 for the decade ending in 1860, there was a fall to 26.6 in the next decade.

Corrected figures show that the rate of increase steadily declined from 26.0 for 1870–80 to 25.5 for the next period, and to 20.7 for the last decade of the century. There was, however, a slight rise — to 21.0 — at the beginning of the present century, followed by an abrupt decline to 14.9 at the latest enumeration.

The cause and significance of this familiar phenomenon have been widely discussed and there is now general agreement concerning the underlying causes. The more or less direct effects of war on population growth are reflected in the lower rate of increase of the post-Civil-War decade. The profound demoralization of the young, adult male population as a result of camp and army life, the spread of venereal disease, the formation of irregular habits, and other concomitants of army life are not conducive to home and family life, and the fact is reflected in the rate of increase.

These war decades were followed by an era of great industrial development in which the economic and social conditions of American life underwent rapid and profound change. By about 1880, the free land and open resources were gone. By 1890, the cost of living had begun to rise and the standard of living to fall. A growing fear of the consequences of large families began to replace the earlier attitude. With the change from an agricultural to an industrial society — from a rural to an urban type of life — the importance of family to the person underwent a corresponding change. With city life came a development of hedonistic activities to compete with home and family. The higher standards of living, the increasing necessity and expense of education, the growing independence of women and the widening of their interests, and the spread of contraceptive information all tended to retard natural increase.

As the diminution of births was in part compensated for by the reduced mortality, reduced fecundity did not show directly in the rate of growth. It was also hidden in part by the increasing immigrant stream. As the development of transportation facilities made travel easy, cheap, and rapid, European laborers responded in ever-increasing numbers to America's industrial call. The result was a considerable total increase in population in spite of a diminishing number of births and a falling rate of natural increase.

Territorial expansion also contributed to the growth of population, though the additions from the annexation of territory cannot be measured accurately. In 1790 the area of the United States was under 900,000 square miles. The enumerated area covered less than half of this and had a population of about 4 million. In 1920 the 450,000 square miles not canvassed in 1790, plus the 2,100,000 square miles added since 1790, had a population of over 60 million.

A comparison of decennial rates of population increase of the two areas discloses the fact that the rate of increase of the original enumeration area began to decline as early as the first decade of the last century, though the rate of increase for the total population did not show decline until the decade of the Civil War, half a century later. The rate of growth of the remaining area showed, until the middle of the century, the characteristics of a pioneer population, and was comparable in its irregularity with that in the parent areas during the first half-century of the Colonial period. In later decades, as the added territory became more densely populated and growth resulted more from natural increase than from migration, the violent fluctuations disappeared and the rate of increase tended more and more to be that of the original enumeration area. In 1920, the rate for the area enumerated in 1790 was 13.6, while that of the remainder of continental United States was 15.9.

PER CENT INCREASE OF THE POPULATION OF THE UNITED STATES, DIVIDED INTO THE ENUMERATION AREA OF 1790 AND THE REMAINDER OF CONTINENTAL UNITED STATES

CENSUS DECADE ENDING	INCREASE IN POPULATION OF AREA ENUMERATED IN 1790 (per cent)	INCREASE IN POPULATION OF REMAINDER OF CONTINENTAL UNITED STATES (per cent)
1790	....	.....
1800	33.5	.....
1810	29.2	653.5
1820	22.3	191.9
1830	23.5	95.3
1840	15.0	101.4
1850	23.7	63.0
1860	18.9	63.7
1870	13.6	33.7
1880	21.5	39.0
1890	17.8	32.5
1900	19.0	22.1
1910	19.0	22.6
1920	13.6	15.9

At the beginning of the American Constitutional Government, the total number of inhabitants was reported as 3,929,214. In the following hundred years the population increased sixteen times. In 1920 it had increased to twenty-seven times the number enumerated in 1790.

This native American stock was composed of two chief racial elements in the ratio of about four to one. Of the total population, 3,172,006 persons, or 80.7 per cent, were classed as Whites, and 757,208, or 19.3 per cent, as Negroes. In the following decades, both racial elements showed a continuous and rapid increase in numbers and diminishing rate of increase; but the rates of increase were not the same and the relative numbers gradually changed to the present proportion of approximately ten white persons to each Negro.

Decennial Increase of the White and Negro Population of the United States

Census Decade Ending	Increase during Decade (per cent)	
	White	*Negro*
1790	....	....
1800	35.7	32.3
1810	36.1	37.5
1820	34.1	28.6
1830	34.0	31.4
1840	34.7	23.4
1850	37.7	26.6
1860	37.7	22.1
1870	24.8	9.9
1880	29.2	34.9
1890	27.0	13.8
1900	21.2	18.0
1910	22.3	11.2
1920	16.0	6.5

During the entire National period the white population has shown a decennial increase that has conformed roughly to the rate in the population as a whole. In general the rate for this element has been slightly higher than the rate for the total population and has shown greater fluctuations from decade to decade. During the first decade of the statistical period, the increase of the white element was 35.7 as compared with 35.1 for the total population. Only twice during the Census period has the decennial increase for the Whites been below that of the total population.

Obviously, then, the Negroes, being numerically the minor element of the population, will show the converse phenomenon in exaggerated form. During the first decade of the period 1790–1800, they increased only 32.3 per cent as compared with 35.1 per cent for the total population and 35.7 for the white element. The two decades ending in 1800 and in 1880, in which the decennial increase of the Negroes exceeded that of the Whites, and consequently that of the total population, are probably due to enumeration inaccuracies. The fluctuations in the rate also are decidedly more marked for the Negro element, varying from 37.5 per cent in 1810, and 34.9 in 1880, to 9.9 per cent in 1870, and 6.5 per cent in 1920.

The discrepancy between the rates of increase of the two racial elements of the population must not be interpreted uncritically as measuring relative racial fertility. The growth of the Negro population had no material assistance from the outside. During the first decades of the National life the natural increase of the Negroes was supplemented by the continued importation of slaves from the West Indies and Africa, and some surreptitious additions of this sort were made as late as the Civil War. These importations probably amounted in all to about 100,000; and perhaps 50,000 more Negroes were added by the accession of territory. In recent decades minor additions have been made by the immigration of Negroes and Mulattoes from the Azores, the West Indies, and elsewhere. But the total from all such sources has been negligible; the increase of the Negro element has been almost exclusively natural. The intermixture of Negroes and Whites with the consequent production of Mulattoes has had no influence on numbers, since these are substitutes for darker-colored persons whom the Negroes would otherwise have produced.

The increase of the Whites is a less simple problem. It was due in some measure to additions from outside. During the first hundred-year period covered by immigration statistics, the total of admissions amounted to over 33 million. To be sure, not all these remained; but those who did remain were, with negligible exceptions, additions to the white element. To these immigrants must be added their descendants, who outnumbered the immigrant stock itself. Thus the rate of increase of the Negroes is comparable with the rate of natural increase of the native white stock, not with the rate of increase of the total white population.

Although the natural increase of the white element does not appear directly in the statistics, it may be found by relatively simple means. By subtracting the net immigration for the decade from the actual increase and correcting the result for the natural increase of immigrants arriving during the period, assuming for purposes of rough approximation that the rate of natural increase of the immigrant families is the same as that of the total population, it is possible to compute the natural increase for the period.

When the net contribution of immigration to population growth is thus eliminated, the rate of natural increase during the past hundred years shows continuous and uniform decline, from 31.8 for 1820–30 to 10.9 for the latest enumeration decade. The rate in 1920 was thus approximately the rate of European increase; and its whole course parallels rather closely the trend of the Negro rate of increase from decade to decade. The increase of the native White has been only slightly more rapid than that of the Negro. In the nineteenth century the native Negro stock increased 663.3 per cent, while the native white stock increased 693.3 per cent.

It is not possible to know with the same accuracy the rate at which the Colonial stock would have increased the population of the country had there been no immigration. The population classed as native white of native parentage is made up of two groups that are partly separable: the descendants of the native white stock enumerated in 1790, and the third and subsequent generations of persons arriving as immigrants since that date. The effort to separate these two elements, and so determine the proportion of the native white population descended from the three million Whites enumerated in 1790, is one of the most fascinating statistical problems of population. It has been estimated that over 95 per cent of the white increase of the first decade was from this source. But in succeeding decades, as the number of immigrants increased and with their descendants formed an increasing element of the population, the percentage contribution of the original native element steadily declined. By the middle of the century the white population included some 2,250,000 persons of foreign birth whose increase was probably 35 per cent of the total white increase; by 1890 this foreign stock contributed about 50 per cent of the white increase. In subsequent decades, owing to the fact that the grandchildren of immigrants are classed as native-born of native parentage, the percentage of increase contributed by the native white of native parentage increased, reaching 68 per cent during the last decade. In the third and subsequent generations, the descendants of immigrant stocks became statistically inseparable from the descendants of the Colonial stock enumerated in 1790.

Immigration becomes more and more a question of labor opportunities. Migration to regions where industries are active and the wages of labor are high takes place without delay or danger and at small expense. The man power to operate great industries is drawn from regions where industry is inactive and labor cheap and plentiful. For the better part of a century the United States has been the highest bidder for surplus labor, and a rapid population growth has resulted. This mobility of labor, which is a relatively new factor in population growth, increases with improvement in means of communication and transportation, and with education, individualization, and the loosening of tribal bonds. As the democratization of the world goes on, immigration and emigration become more and more movements of men governed by industrial demands. The increase of the American population from immigration, or its decrease through the departure of labor to other regions, will be determined, not so much by the aberrations of statesmen as by economic and social forces which are outside the orbit of political control.

A second — relatively new — determining factor in the growth of population is discernible in the rapid, general, and continuous decline in the birth-rate among those classes of American and European society which have easy access to sources of contraceptive information. Apparently it will be only a brief time before this information will cease to be the exclusive possession of the enlightened classes. In the present state of information, the ultimate effects of bringing the size of family within the control of all may not be predicted. It may come to pass that the fecundity of the dispossessed classes will fall to a point as low as, or even lower than, that already reached by the more enlightened groups, and organized society may be forced to assume the financial burden of rearing the citizens it desires.

In any event, these two relatively new and unknown quantities — the increasing mobility of men and the increasing ability of men to control reproduction — make prediction concerning the rate of population increase even in the immediate future an extra-hazardous type of speculation.

CHAPTER III

NATURAL INCREASE OF POPULATION

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That the rapid falling-off in the rate of increase of population in the United States cannot be accounted for by the decline of immigration is shown by the fact that there has been but little change in the proportion of foreign-born in the population during the last sixty years, this having varied but little from 15.5 per cent. It seems clear, therefore, that the decline is due primarily to a decline in the birth-rate.

Since accurate vital statistics have been lacking, the investigation of the reduction in the birth-rate has generally taken the form of showing that the number of children per family has been declining. Naturally most of the data relate to the older States of the Northeast. Frederick L. Hoffman says that Nathan Allen, of Lowell, Massachusetts, called attention to the decline in fecundity of New-Englanders as early as the sixties of the last century.[1] Studies by Engel and Hoffman show conclusively that in some classes this decline had set in during the latter part of the eighteenth century.[2]

In the last fifteen years a number of studies have shown the decline in the size of the family. The Rhode Island Census of 1905[3] showed that fewer native-born than foreign-born women married, that more of the former were childless, and that those who did have children had fewer of them. Professor Willcox's studies on the proportion of children to women confirmed certain aspects of these results. The Immigration Commission added new evidence and called attention to the marked difference between the size of families in rural and in urban populations. The wide publicity given the Commission's data, showing that immigrant women, especially in Rhode Island, had larger families than native women, led to the conclusion that our immigrant population was increasing more rapidly than our native population, both because of the large number of immigrants and because of the large excess of births over deaths in this group. But the fact that the report also showed a marked difference between the rural and urban populations in respect to the size of families seems to have been quite generally overlooked.

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[1] Frederick L. Hoffman, 'The Decline in the Birth-Rate,' *North American Review*, May, 1909; p. 686.

[2] *Ibid.* [3] *Ibid.*

All these studies have shown that people with higher incomes and better social positions have the smaller families. Families of college graduates on the average fail to reproduce themselves. One investigation of the alumnæ of certain women's colleges showed, when the actual relation between deaths and births was calculated, that the ratio was about 20 deaths to 11 births, indicating that the group studied was very rapidly dying out.[1] The average number of children born to Vassar alumnæ has never exceeded 1.5 per alumna.[2] The average in more recent classes, where families are, however, probably complete, is 1.2, which is a slight increase over the average of those graduating during the middle nineties. Whether this indicates a genuine tendency toward larger families cannot yet be told. The families from which present Vassar students come are larger than those of Vassar alumnæ, and show a slightly larger average as the combined education of the father and mother becomes less; although the highest average, 3.1 children, is only .5 of a child in excess of the size of the families of Vassar graduates who married and had children.

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[1] Mary Van Kleeck, 'Census of College Women,' *Journal of the Association of Collegiate Alumnæ*, May, 1918.

[2] Mabel Newcomer and Evelyn Gibson, 'Vital Statistics from Vassar College,' *American Journal of Sociology*, January, 1924; p. 430.

A more intensive study of the size of native families from which college students come, and the collateral lines of these families, has recently been made by Baber and Ross.[1] This study shows that the average number of children born in fertile families to the parents of students and collateral lines was 3.35. When infertile unions are included, it was only 2.8. Compared with the number of children in the families into which the students' parents were born, we find a falling-off of 2.08 or 38.4 per cent. This study shows that the whole class from which college students come — not the group of college graduates alone — is scarcely reproducing itself. However, it is well to note in this connection that the size of the native families in Baber's study is about 10 per cent greater than the size of families from which Vassar students come; about the same amount higher than the native families of Mount Holyoke students; but only about 5 per cent higher than that of all families from which Mount Holyoke students come.

Samuel J. Holmes's study of California students' families[2] confirms the findings of the Wisconsin study and shows quite clearly that the education of the parents, as well as their nativity, influences the size of the family, a fact further substantiated by various other studies. Professor Holmes has also shown that when both parents are Catholics, the size of the family is about 27 per cent greater than when both parents are Protestants. Yet in mixed Protestant and Catholic families the number of children is somewhat smaller than in Protestant families.

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[1] R. E. Baber and E. A. Ross, *Changes in the Size of American Families in One Generation.* University of Wisconsin Studies in the Social Sciences and History, Madison, 1924.

[2] S. J. Holmes, 'The Size of College Families,' *The Journal of Heredity*, October, 1924; pp. 407–15.

The findings of these studies may be summed up as follows: (1) The number of infertile marriages in the classes from which college students come is exceedingly high, varying from 10 per cent among the farmers of Baber's study to 20 to 22 per cent among graduates of women's colleges. (2) The number of one-child families is very high, about 17 per cent in Baber's study and about 22 to 24 per cent among the alumnæ of Eastern women's colleges. (3) The percentage of men and women in these classes who do not marry at all is very high — the graduates of women's colleges averaging something over 45 per cent, Harvard and Yale graduates averaging about 25 per cent, while other groups probably run about 15 to 20 per cent, a percentage still well above that of the general population. (4) Occupation seems to have a definite relation to size of family. Baber and Ross found that farmers have the largest families of any group from which their students came, averaging about one half of a child more than the few unskilled laborers included in the study, about one child more than the skilled laborers, 1.1 more than the professional men (ministers excluded), and about 1.33 more than business men. (5) In the classes of the population and in the sections of the country studied, the foreign-born have larger families than the native-born. The relations between nativity and economic status, and size of family have, however, never been very carefully worked out, so that just what proportion of the greater size is to be attributed to each cause is an open question. (6) In all likelihood, religious faith has some influence upon the size of the family, although the relative influence of religious faith, occupation, nativity, and economic status must be more carefully investigated before any definite conclusions can be reached.

When the limitations of these conclusions are borne in mind, it will be seen that the generalization commonly made from the evidence is not warranted. It is by no means clear that the old native stock in the United States, as a whole, is increasing slowly, if at all, while the immigrant stocks, especially the newer ones, are increasing rapidly; nor that, as a result of this process, the Anglo-Saxon and Northern European or Teutonic stock is being rapidly submerged in the tide of Southern and Eastern Europeans and their children.

In what follows I hope to throw some additional light on the actual situation in the United States as regards natural increase of population. I shall take the position that the old native stock is not dying out, except in the cities of the United States; that it is increasing slowly in the rural sections of a few of the States, chiefly in the far Northeast and extreme West; that it is increasing as rapidly as the newer immigrant stock in most of the States between the Alleghenies and the Pacific Coast States; and that it is increasing even more rapidly in the Southern States. The data presented in support of this position come from three sources: the Census, the birth reports of the Bureau of the Census, and an investigation of the size of families from which college students come.

Several years ago, in making certain calculations from the 1910 Census, I found that the proportion of children to women varied widely in different parts of the country, and that the generalization, regarding the slow growth of native stock as compared with immigrant stock would have to be modified as a larger body of facts became available. The table on page 39 summarizes this information for 1910 and 1920.

The table shows conclusively that married women of rural districts have more children than married women of urban districts. In 1910, no section of the rural population had so small a ratio of children to women as the highest in the urban population, not even New England, which had the highest of the urban and the lowest of the rural ratios. In 1920, however, the rural areas of the Pacific States had so fallen off that they were equaled by the urban districts of the Middle Atlantic States and exceeded by those of New England. In all other sections, however, the rural exceeded the urban ratio by a good margin, the percentage of excess of the rural over the urban for the whole United States being 38.81. It is true that there are more young married women in the rural than in the urban population, but this excess amounts to only 4.4 per cent absolutely, and 14 per cent relatively, in the age group 15–24, and to only 8.5 per cent absolutely, and 11 per cent relatively, in the age group 25–34, for the whole United States. Thus it is clear that the greater percentage of young married women in the rural population is not sufficient to account for the larger ratio of children found there. Yet, even if this excess of young wives did wholly account for the larger ratio, the fact in no way disproves the general contention that the rural population has a considerably higher rate of natural increase than the urban. It only shows one of the reasons for this. It is, in fact, conceivable that of the two populations having markedly different marriage-rates, the one having the higher might increase the more rapidly, even though the average number of children per family were

Number of Children under Five in Urban and Rural Areas of the United States, 1910 and 1920

	Per 1000 Women Aged 15–44 inclusive		Per 1000 Married, Widowed, or Divorced Women Aged 15–44 inclusive		Percentage in Total Population, 1920	
	1910	1920	1910	1920	Foreign-born	Foreign stock
United States						
Urban	382	391	660	629	19.1	48.0
Rural	603	580	933	873	6.5	20.1
New England						
Urban	384	417	714	732	28.0	66.9
Rural	458	488	718	763	14.9	38.5
Middle Atlantic						
Urban	402	417	709	688	25.4	60.9
Rural	518	547	827	843	12.0	33.0
East North Central						
Urban	382	403	645	627	19.2	50.7
Rural	523	528	828	809	8.4	29.9
West North Central						
Urban	344	344	588	562	12.8	39.8
Rural	582	555	938	874	9.8	36.7
South Atlantic						
Urban	393	377	672	604	5.1	14.6
Rural	678	651	1066	990	1.0	2.5
East South Central						
Urban	378	359	632	558	2.4	9.6
Rural	696	642	1047	947	0.3	1.2
West South Central						
Urban	405	361	633	541	7.4	17.6
Rural	729	676	1050	895	3.3	8.7
Mountain						
Urban	382	388	601	586	14.9	40.8
Rural	641	644	907	890	12.8	33.7
Pacific						
Urban	301	294	489	441	19.7	46.9
Rural	509	495	754	688	16.7	40.0

smaller. For this reason columns one and two of this table give a better idea than three and four of the relative rates of increase of the two classes.

The sections of the country which are not yet highly industrialized and urbanized — namely, the States west of the Mississippi and those south of the Ohio and Potomac Rivers, except the West Coast States — have the highest ratios of children to women in the rural area. In the urban districts, however, the Northeast, where the urban population is largely made up of immigrant stock, has a higher ratio of children to women than other parts of the country. Unfortunately, it is not possible to get the ratio of children to married women by States for the urban and rural white populations; consequently the Southern States cannot be compared individually with the Western States in this respect; but those States where the Negroes do not constitute any considerable proportion of the population can be compared with one another and the contrast between the urban and rural populations brought out. The table on page 41 presents the most significant of these.

The States given in this table are typical of different parts of the country except the South. It is clear from these figures that the native rural population is holding its own, even in the North and West, in comparison with the foreign city population, although in the cities the foreigners greatly exceed the natives in number of children. The table on page 42, if used in conjunction with the one on page 41, shows the extent to which the immigrant cities exceed the native cities and are in turn exceeded by the rural population.

Column two of the figures in the table on page 42 shows the proportion of children under five years of age per thousand married, widowed, and divorced women in

Number of Children under Five in Urban and Rural Areas of Certain States, 1920

State	Per 1000 Married, Widowed, or Divorced Women, Aged 15–44 inclusive	Per cent of Foreign-Born	Per cent of Foreign Stock
Maine			
Urban	642	19.7	48.1
Rural	746	10.3	26.8
Massachusetts			
Urban	719	28.6	68.1
Rural	742	16.0	42.4
New York			
Urban	628	30.1	68.8
Rural	684	11.2	33.2
Pennsylvania			
Urban	695	18.3	48.4
Rural	943	11.6	31.1
Ohio			
Urban	576	15.5	41.4
Rural	781	5.2	18.2
Wisconsin			
Urban	685	20.4	63.9
Rural	914	14.8	55.3
Nebraska			
Urban	549	14.6	41.1
Rural	851	10.1	39.8
Kansas			
Urban	516	6.4	20.2
Rural	799	6.2	24.0
West Virginia			
Urban	607	5.4	15.6
Rural	968	3.9	7.9
Oklahoma			
Urban	469	2.6	9.0
Rural	798	1.7	6.2
Colorado			
Urban	475	13.2	36.8
Rural	834	11.8	31.8
California			
Urban	409	20.3	27.9
Rural	609	19.1	43.0
Oregon			
Urban	452	15.7	40.0
Rural	700	10.4	29.3

Number of Children at Various Ages in Certain Cities and Percentage of Foreign-Born, Foreign Stock, and Negroes (except in Wards), and Predominant Nationality in Foreign Wards

Cities	Children 0–6 per 1000 Women 18–44	Children 0–4 per 1000 Women 15–44 (married, widowed, and divorced women)	Per cent Foreign-Born	Per cent Foreign Stock	Per cent Negroes	Predominant Nationality
Atlanta	438	404	2.4	6.4	31.3	
Birmingham	502	440	3.4	9.1	39.3	
Boston	564	688	31.9	73.3	2.18	
2 Foreign wards	454		26.9	74.2		Irish
2 Foreign wards	1032		46.6	92.4		Italian
4 Native wards	473		22.6	59.3		
Buffalo	622	671	24.0	66.4	8.9	
2 Foreign wards	1104		35.5	90.9		Poles
2 Native wards	446		15.6	52.7		
Chicago	596	609	31.0	72.0	4.0	
3 Foreign wards	990		39.2	88.5		Poles
2 Foreign wards	1147		47.1	95.3		Italians
2 Native wards	247		12.0	30.6		
3 Native wards	514		22.7	65.8		
Cincinnati	449	485	10.7	41.0	7.5	
Cleveland	663	644	30.1	68.9	4.3	
2 Foreign wards	982		40.3	85.0		Poles — Slavs
3 Native wards	334		17.4	48.6		
Denver	418	420	18.2	40.9	2.5	
Detroit	659	658	29.1	64.3	4.1	
Indianapolis	462	440	8.5	19.1	9.3	
Kansas City	394	385	8.4	26.0	8.5	
Louisville	436	450	4.9	23.5	17.1	
Memphis	379	347	3.6	11.3	37.7	
Minneapolis	503	583	23.1	63.9	1.0	
New Orleans	484	489	6.7	24.6	26.1	
New York City	578	637	35.5	76.4	2.7	
5 Foreign Ass. Dist's Bronx	591		40.0	84.1		Russian
2 Foreign Ass. Dist's Brooklyn	919		46.9	82.8		Italian
3 Foreign Ass. Dist's Manhattan	882		48.8	92.5		Italian — Russian
4 Native Ass. Dist's Brooklyn	389		20.4	57.1		
3 Native Ass. Dist's Manhattan	261		19.7	49.6		
3 Native Ass. Dist's Queens	571		20.9	61.5		
Omaha	514	515	18.5	49.3	5.5	
Philadelphia	589	624	21.8	54.2	5.5	
2 Foreign wards	824		31.6	71.0		Italian — Russian
3 Native wards	555		13.9	43.0		
Pittsburgh	641	682	20.4	56.7	6.4	
2 Foreign wards	760		29.5	65.6		Italian — Russian
2 Native wards	383		12.0	38.4		
Portland, Ore.	456	439	18.2	45.2	0.6	
Providence	603	705	29.0	70.7	2.4	
1 Foreign ward	949		39.6	86.9		Italian
2 Native wards	453		19.7	55.7		
Richmond	482	511	2.7	8.5	31.5	
Salt Lake City	666	517	20.5	51.2	0.8	
San Antonio	528	508	22.7	43.7	8.9	
San Francisco	382	398	27.7	63.7	0.5	
Seattle	446	428	23.4	56.1	0.9	

representative cities. Several cities exceed rural California in the proportion of children, and Boston exceeds rural New York, but in all other cases the rural proportion considerably exceeds that of the cities. There are almost as striking differences between cities as there are between the cities and the rural portions of the States, even when the proportions of foreign-born and foreign stock are virtually the same; for example, San Francisco and Buffalo, Philadelphia and Seattle. Kansas City and Indianapolis, the cities most largely native in which Negroes number less than 10 per cent, have much smaller proportions than cities with a high proportion of foreign stock, such as New York City, Chicago, Detroit, and Cleveland. Clearly, the cities of newer foreign stock greatly surpass the native cities, although they do not come up to the rural districts. The exact situation in the cities is brought out clearly when wards or districts in which the foreign-born predominate are compared with wards or districts in which they form a comparatively small proportion.

In general, wherever Poles, Italians, and other Southern and Eastern Europeans predominate, a much higher ratio of children is found than in the wards inhabited largely by natives and Northern and Western Europeans. Judging from the Census data, there seems to be little difference between the natives of older stock and the Northern and Western Europeans, who, if avoiding large families is any criterion, seem to be pretty thoroughly assimilated.

At the same time, wards which apparently have much the same population composition differ greatly in the ratio of children. In Buffalo, for example, one ward having about 16 per cent foreign-born, largely English-Canadians and Germans, has only 353 children per thousand women, while another ward almost exactly like it in composition has 496. In Philadelphia, a ward with about 21 per cent foreign-born has only 372 children, while another ward, with about 12 per cent foreign-born, has 634. The presence of rooming-house districts may partially account for these differences; but probably social and economic status is also an important factor. The difference between the districts of the Bronx and Manhattan, in both of which Jews predominate, also suggests that social and economic status is as much a factor with the foreigner as with the native.

Enough data have been given to show that in our cities the newer immigrants are contributing by far the largest share to the next generation. An explanation of this is the fact that these newer immigrants still have the standards of the rural peoples from whom they come. There is no reason whatever to believe that Italians and Poles will not be affected by city life in the second and third generations, much as the Germans and Irish and English are now being affected. Only so long as these immigrants retain the rural standards of the old country will they have the large families now customary. Any other outcome would only prove their superior fitness to survive in a modern industrial civilization.

We have seen that in the United States as a whole and in a selected group of States representative of different parts of the country, the rural districts invariably have a larger ratio of children than the urban. Again, comparing all children under 7 and all women from 18 to 44, as we did in the cities and wards, we find striking differences in the ratios for those parts of the counties outside of cities of 10,000 or more. It may be well to mention here that the shifts in base made in this study were necessary because the Census publications do not contain as detailed data for the rural and urban population of the States, for the counties, and for the small cities as they do for the larger cities.

Although no large city in the table and only one medium-sized city exceeds the ratio of 663 (Cleveland) and very few of the larger cities approach 600, yet the outlying districts of Ohio counties around cities of 10,000 or more have a ratio of 833. In Pennsylvania the ratio for similar districts is 943. In 15 counties in Ohio having no city of 2500 or over, the ratio is 844, and in 9 counties of similar constitution in Pennsylvania, it is 916. In 38 counties in Ohio having no city of 10,000 or over, but with about one third of the population living in places of 2500 to 10,000, the ratio is 749; while in 20 counties in Pennsylvania, similarly constituted, it is 960. In both classes of Ohio counties, the population consists almost entirely of old native stock and in the strictly rural counties of Pennsylvania it is also largely native, averaging only about 2 to 3 per cent foreign-born. In the 20 Pennsylvania counties, however, the percentage of foreign-born is considerably higher, averaging a little over 10 per cent. The Negroes are less than 1 per cent of the population in all these counties. In contrast to the rural and semi-rural parts of these Pennsylvania and Ohio counties, we find that the ratio of children under 7 to women 18 to 44 of all classes, in all cities of over 100,000 in the United States, is 553. The Negroes pull down the average for the large cities somewhat; still, after due allowance, this is somewhat below that of the urban population as a whole. In cities having 2500 to 100,000 inhabitants the number of children under 5 per thousand women 15 to 44, all classes, is 400, as compared with 363 for the large cities.

Carrying still further the comparison between certain types of counties, we find that, in Alabama, 7 counties, in which the percentage of Negroes is less than 6, have 1225 children under 7 per thousand women, 18 to 44; while 5 counties, in which the Negroes are over 75 per cent of the population, have only 864. The latter counties are also slightly more urban than the former. In 12 counties in West Virginia having no cities of 2500 or more, where the combined Negro and foreign population is less than 2 per cent, the ratio is 1208; while it is 1059 in 7 rural counties in Colorado which are native White, the highest percentage of foreigners in any of them being 6, and the average not over 3, with Negroes scarcely one tenth of one per cent. In other States having similar conditions, the proportions run much the same, and in every case the distinctly rural districts greatly exceed the urban, especially the larger cities.

To sum up, if the number of children 0 to 4 years of age for each thousand women 15 to 44 years of age in cities of over 100,000 population be taken as 100, then the ratio of children to women in places of 2500 to 100,000 will be 107.0, that in the rural districts of fifteen Southern States will be 166.7, and that for the remainder of the rural population of the United States, 143.5.

Let us now consider briefly the data of the reports on birth statistics, to see whether these confirm the general position which I have taken.

The reports for 1921 and 1922 contain tables in which are given the number of births per thousand married women 15 to 44 years of age, native, foreign, and Negro. The numbers are respectively 169.5, 177.4, and 152.3, for 1921; and 154.9, 158.8, and 138.4 for 1922. Thus it appears that the foreign-born have the highest rate; the native-born Whites come next, with a slightly lower rate; while the Negroes are a poor third, about 14 per cent below the foreign-born in 1921, and about 13 per cent below in 1922.

There seem to me, however, to be two or three factors which need a closer examination than they can receive here, before we can draw a final conclusion from these figures. In the first place, the age distribution of native and foreign married women within the 15 to 44 group is not the same and favors slightly the former. On the other hand, there is good reason to believe that the Registration Area, as now constituted, does not give proper weight to the native stock in those parts of the country where the birth-rate is highest. The South and Middle West are not so fully represented in the statistics as are the industrial communities of the Northeast. Furthermore, many of the States of the South and Middle West have only lately been included in the Registration Area, and there can be no question that the figures from these districts are less accurate than in regions where vital statistics have been collected for many years. Moreover, the chief errors of omission are undoubtedly in the rural districts, where doctors are few and hospitals almost unknown. I do not believe that, when these factors are taken account of, the corrected birth-rates will overthrow the position I have taken.

I call attention also to the 1920 report which shows the average number of children born to women classified according to their husbands' occupations. Miners' wives have the highest number, with 4.3; farmers' wives are second, with 3.8; wives of laborers in manufacturing and mechanical industries are third, with 3.7. There are other occupations with higher averages than those of farmers and laborers, but they are generally those in which comparatively small numbers are engaged. At the other end of the scale, we find managers in manufacturing, with 2.5; bankers, brokers, and money-lenders, with 2.3; teachers, with 2.3; and technical engineers, with 2.1. The professions as a whole average about 2.3. Many questions of nativity, age distribution, and habitat complicate these results, but the fact that the two highest groups live largely in rural communities indicates that rural life bears an important relation to the number of children in the family. Incidentally, it is interesting to note that those counties where coal mining is an important industry invariably have a high ratio of children under 7 to women 18 to 44. This is true, whether they are Pennsylvania counties (about 1150 to 1200) with a considerable proportion of new immigrants (20 to 25 per cent of the total population foreign-born), or Kentucky and West Virginia counties (about 1125) with virtually no foreigners (4 to 5 per cent), or Illinois and Ohio counties (about 900) with a large proportion of natives, a good many English and Welsh, and a few newer immigrants.

Finally, I give briefly the results of an investigation which we made regarding the size of families from which college students come. Our results differ considerably in some respects from those of other studies, as will be seen from the accompanying table.

About twenty years ago, when the present college students were being born, farmers in all sections of the country still had families averaging over 4 children and in the States west of the Mississippi and south of the Ohio and Potomac Rivers, the average was from 5.34 to 6.61. For the South, as a whole, the average was 6.26, which is larger than most studies, based on Northern data, have given for the grandparents' families of the present college students. Certainly in the rural South, with an average of 5.13 for all occupations, the native stock is increasing at a goodly rate.

AVERAGE NUMBER OF CHILDREN IN FAMILIES FROM WHICH COLLEGE STUDENTS COME

DIVISION	ALL FAMILIES	FAMILIES OF PROFESSIONAL MEN	FAMILIES OF MEN ENGAGED IN TRADE	FAMILIES OF MEN ENGAGED IN MANAGERIAL WORK	FAMILIES OF MEN ENGAGED IN AGRICULTURE
New England	3.51	2.97	3.59	3.39	4.66
Middle Atlantic	3.59	3.40	3.51	3.38	4.22
East North Central	3.86	3.48	3.47	3.62	4.66
Wisconsin (Baber and Ross)	3.35	3.20	2.90	2.90	4.20
West North Central	4.40	4.08	3.71	3.43	5.34
South Atlantic	5.31	4.46	4.41	4.56	6.61
East South Central	5.04	4.66	4.14	4.04	6.15
West South Central	5.05	5.72	3.91	4.50	6.09
Mountain	4.14	3.12	3.47	3.59	5.72
Pacific	3.94	3.87	3.32	3.00	5.64
California (Holmes)	3.66				

The general results of this investigation seem to me to bear out the position taken above, that studies based on data collected in the northeastern part of the country are good only for those particular sections, and that the distinction between rural and urban cannot be ignored if we are to arrive at an adequate notion of the natural increase of population in the country at large.

Two general statements sum up the foregoing discussion:

(1) The rate of natural increase in the United States at the present time is probably a little higher than that shown by a subtraction of the death-rates from the birth-rates for the Registration Area. Our vital statistics reports give a figure about 10 to 11, whereas it is probably nearer 12, or 12.5, if we allow for the higher birth-rates of that part of our population which is not adequately represented in our registration reports.

(2) There is a decided differential between the birth-rates of different classes of the population. In the cities the older, native stock of Teutonic origin is rapidly dying out and is being replaced by peoples from Southern and Eastern Europe. In other words, the hand-laboring classes of our cities are contributing more than their present proportion to the next generation, while the clean-handed workers, particularly the highly educated and more successful among them, are not reproducing themselves, still less adding to their numbers. In the country there is still a good rate of natural increase, and virtually all of it comes from older Teutonic stock, whether classified as native or immigrant. In my opinion this rural increase is even greater than that of the poorer immigrant workers of the city. It is a great pity that we do not possess data which will place such an important matter beyond the realm of opinion.

My conclusions from this study, which necessarily rest, in part, on a general attitude toward population problems which cannot be stated here, are:

(1) The rate of natural increase in the United States is higher than that of most other parts of the world, and is probably as great as can well be taken care of under the economic conditions now existing, since the first flush of youthful exploitation is past. Indeed, it seems doubtful whether we can support such an increase for many decades. But there are clear indications that our natural increase is on the decline in all classes of the population so that it probably will not outrun the possibilities of maintaining or improving conditions of living for some time yet, possibly half or three quarters of a century, provided immigration is not too great.

(2) Much of the improvement in living conditions throughout all classes of the population has been achieved

at the expense of the size of the family. This is particularly true of the people in the cities who belong to the income classes ranging from $1500 to $5000 — the skilled mechanics, the clerical workers, the professional groups, those holding the lesser managerial positions, and the great bulk of the small tradesmen.

(3) The differential birth-rate raises very important problems. I have elsewhere taken the position that the dying-out of certain upper- and middle-class groups in our population is probably not so serious a matter, from a long-time point of view, as is generally assumed. Even so, it remains a serious question whether our present urban-industrial civilization can be so modified that family life will be given a place in it, or whether it will turn, like Frankenstein's monster, and destroy its creators. I make an earnest plea for the study of this phase of our population problem. The history of civilization shows us that man is the product of rural conditions of life. Like Antæus, he seems to retain virility only when he is in contact with Mother Earth. Can we change his nature? Or can we more easily adapt our civilization to give man his needs? Here is a problem which should challenge man's best efforts.

CHAPTER IV

URBANIZATION OF POPULATION

By HORNELL HART

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What is the social significance of the increasing concentration of the population of the United States in cities? In 1790, one person out of thirty in the United States lived in a city of over 8000 population; to-day nearly one person out of two lives in such a city. At the rate at which the percentage of urban population has increased since 1890, the whole population of the United States would become city dwellers in another two hundred years. This rate, however, will obviously not be maintained. The rate of increase in the percentage of urban population may be expected to slow up in the next few decades.

The problem of predicting this percentage could be attacked by fitting to the data a curve of the general type used by Raymond Pearl in forecasting the populations of given areas. Any such prognostication would, however, be subject to reservations dependent upon unforeseeable developments in agricultural, industrial, and commercial methods. For practical purposes, it is sufficient to know that the percentage of population in cities of over 8000 will undoubtedly pass the 50 per cent mark some time between the Census of 1930 and that of 1940.

The question naturally arises whether there is any general law of urban growth — any life-cycle for cities. If such a law exists, it cannot be stated in terms of growth as a function of size. The percentage increases for cities of over 25,000 in the decade 1910 to 1920 show no significant correlation with the sizes of the cities in 1910. Detroit more than doubled in size, while Pittsburgh gained only 10 per cent. The average of the rates of growth for cities of over 100,000 was about 30 per cent, and this rate was approximately the same as that for smaller cities. It seems highly improbable that any city of a million population can duplicate the achievement of Hamtramck Village, Michigan, and gain 1266 per cent in ten years. At that rate of growth, a large city like Detroit would become in the next decade a metropolis of a billion and a quarter population. Barring such extreme phenomena, however, it seems clear from past records that large and small cities are about equally likely to grow fast.

For individual cities, predictions as to future rates of growth can be made with more accuracy. The American Telephone and Telegraph Company has for some years past made a practice of predicting the growth, not merely of cities, but of individual city blocks. If chambers of commerce should become interested in ascertaining the factors which actually determine the growth of cities, instead of engaging blindly in publicity and propaganda, they might promote the working-out of basic principles as to the influence of rail and water transportation facilities, topography, location of industries, real estate speculation, rates of wages, costs of living, rents, birth- and death-rates, efficiency of city government, and other factors in urban development.

Much more important in ultimate social significance than the prediction of the size of urban populations is the effect of migration to cities upon the qualities of the populations in the cities, in the rural areas, and in the country as a whole. An analysis of Census data showing something of the age, sex, and nativity distribution of the migrants from rural areas to cities has already been published.[1] The results of that analysis indicated that between 1890 and 1910 about one third of the growth of cities of over 25,000 in the United States was due to excess of births over deaths; from one third to one half was due to foreign immigration; and the rest to migration from rural districts to the cities. Migration from the country to the city was more important in the cities under 100,000 than in larger cities. Negroes constituted about one fifth of the migrants to urban centers. Four fifths of the migrants to cities were between the ages of ten and thirty. Migrants from country districts came at even earlier ages than immigrants from abroad. Girls tended to come to the cities at ages about two years younger than boys.

These results were reached by estimating, for each age, sex, race, and nativity group enumerated at a given Census, the number of survivors from the persons of corresponding age, sex, race, and nativity at the preceding Census. In order to apply this method in a completely satisfactory way, it would be necessary to have age distributions by five- or ten-year groupings for each sex, race, and nativity group, and to have accurate death data for the decade. Unfortunately, these conditions are very imperfectly met. While detailed age distributions are given for the large cities, they are lacking for those of less than 100,000 population. For groups of cities according to size, the age distributions are so broad as to make accurate analysis quite impossible. Data as to deaths are available only for registration cities. Life tables have been calculated for a few of the largest cities for 1910, and mortality tables have been published by the Bureau of the Census for 1910 and 1920 for each city of over 500,000 population. These last-named tables come the closest to providing the needed death-rates; but they omit all information as to smaller cities, and the fact that the influenza epidemic occurred during the decade makes an average of the 1910 and 1920 death-rates an inadequate index of deaths between the Censuses.

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[1] Hornell Hart, *Selective Migration*, University of Iowa Studies in Child Welfare, vol. 1; Iowa City, 1921.

In view of these difficulties, it has been thought inadvisable to attempt a general estimate of the extent of urban migration during the latest intercensal period. Instead, as an illustration of the possibilities of the method, there has been prepared a careful study of migration to Chicago during the decade. The age, sex, race, and nativity classifications for cities of over 100,000, as given in the Census, are amply detailed. From the annual mortality reports, death-rates based upon the whole ten-year period can be built up. The method of analyzing the data is shown in the accompanying table.

According to this table, in the decade from 1910 to 1920, approximately 119,000 men migrated into Chicago in excess of the number migrating out. Similar methods applied to the female population show that during the same period the net migration of women into Chicago was 118,000. The total gain of the city in ten years through migration was therefore about 237,000 persons.

The age distribution of these migrants is significant. Four fifths of them were at ages between 15 and 30, and the most frequent age was about 20. The average age of entrance of the men is 23, and of the women, 20, indicating again the tendency of women to migrate to the city at earlier ages than men.

ESTIMATION OF MIGRATION TO CHICAGO, 1910 TO 1920, TOTAL MALE POPULATION (*in thousands*)

Age Groupings		Annual Death-Rate	Ten-Year Surviv-als Rate	Popula-tion in 1910	Surviv-ors in 1920	Popula-tion in 1920	Migra-tion
1910	1920						
0– 4	10–14	4.7	953	113	107	111	4
5– 9	15–19	2.6	971	96	93	97	4
10–14	20–24	4.4	956	93	88	114	26
15–19	25–29	6.0	939	100	94	143	49
20–24	30–34	7.4	928	126	116	138	22
25–29	35–39	8.3	920	126	116	128	12
30–34	40–44	10.8	896	105	94	96	2
35–39	45–49	13.1	874	91	80	83	3
40–44	50–54	17.9	835	78	65	67	2
45–49	55–59	22.8	793	64	51	47	–4
50–54	60–64	32.0	721	49	35	34	–1
55–59	65–69	41.0	658	29	19	19	0
60–64	70–74	56.8	554	21	11	11	0
65–69	75–79	78.9	435	13	6	6	0
70–74	80–84	103.7	331	8	3	3	0
0 –74	10–84			1,112	978	1,097	119

That this net gain to Chicago was due chiefly to foreign immigration appears from an analysis of the racial and nativity groups. Of the total of 237,000 persons, 154,000 were of foreign birth. Still more striking is the fact that of the 83,000 net migration of natives of the United States, 63,000 were Negroes, leaving Chicago a net gain in population through the migration of native white Americans of only 20,000.

A study of the age distribution of these native migrants shows that approximately 45,000 native Whites at the ages 15 to 25 entered the city during the decade, but that this incoming stream was in part counterbalanced by a very marked emigration of native-born Whites at the ages 30 to 60. This exodus consisted chiefly of women.

These tendencies raise some exceedingly interesting questions. With the cutting-down of immigration by the recent sharply restrictive regulations, will the growth of cities like Chicago be curtailed? During the decade 1910 to 1920, Chicago had a growth amounting to about half a million. Of this growth slightly more than half was made up of excess of births over deaths. Thirty per cent of the entire gain was due to foreign immigration, and 42 per cent to the migration of Negroes and foreigners combined. If migrants from foreign sources should be markedly restricted, would native Whites or Negroes take their places, or would the rate of urban growth slow up? The answer at present must be largely speculative; but, in any event, cutting down immigration will unquestionably tend to lower the birth-rate in cities, since neither native Whites nor Negroes are reproducing as rapidly in cities as are the foreign-born.

The issues raised by the data from Chicago suggest the value of further intensive studies of migration to other cities. Data needed for the application of the method used above to the eight largest cities of the country are already available; and by more complicated methods, analyses might be made of groups of smaller cities.

Migration has a profound effect upon the qualities of populations if the migration is of a selective character. It has generally been assumed that the individuals who leave the rural districts to enter the cities are superior in initiative and intelligence to those who remain behind. If this is true, the continual removal of these superior individuals from the country districts is likely to depress seriously the ability and energy of the farming population. No satisfactory proof of the assumption has thus far been brought forward, although common sense and casual observation make it seem highly probable. It is true that in a number of studies children in rural districts have been found to be decidedly inferior to the average city child in ability to score in mental tests. This may be due, however, at least in part, to the isolation of the rural child and to inferior educational advantages. It is true, also, that the cities produce a far larger proportion of the leaders in the professions, business, politics, and science than do the rural areas. Yet here again it is difficult to make out just how important are the sharper stimuli and the greater opportunities of the city in producing distinguished men and women.

In my recent study of a city of 50,000 population in the Middle West, mental tests were given to 248 children whose families had come from places outside of cities of over 25,000 population; to 130 children whose families had come from other cities of more than 25,000 population; and to 447 children whose families had lived since before their births in the city studied. The comparative average mental-test quotients of these three groups of children were found to be:

Group	Average Mental-Test Quotient
Families from rural areas and small towns	97.0 ± .5
Families from other large cities	99.4 ± .7
Families from the city itself	99.3 ± .4

The difference between the average mental-test quotients of the children born and reared in the city and those whose families had migrated from smaller places or rural districts was 2.3 ± .6, so that it seems quite certain that these children were inferior to those from non-migrant families in regard to ability measured by these mental tests. They were, besides, emphatically inferior in their school progress. Whether these inferiorities were less than those of the children remaining in the rural areas cannot be determined from present data. At any rate, migration from the country was not raising the mental-test ability of the population in the city studied.

A number of studies have recently been made of the mental abilities of rural children. If follow-up inquiries could be added to ascertain which of these children afterward migrated to cities and which remained in rural districts, valid conclusions might be drawn as to the selective character of such migration in districts of the sort investigated. In the absence of such studies, conclusions can hardly be final, although surveys of social conditions in rural districts in the East and Middle West suggest a marked deterioration in recent decades.

To summarize such findings as can be drawn from available data, it seems probable that the rate at which urban population is outstripping rural is likely to decline rather than to increase. This seems clear both from the character of past changes in the urban population percentage and from the fact that immigration, which has furnished a large proportion of the urban growth, is being sharply restricted. If Negro migration to Northern cities should take the place of foreign immigration, as it seems to have done during the War, this would introduce highly perplexing complications into the population problem and into other social problems of our cities. The strong probability that migration from the country districts to the cities is selective in character makes it important that further inquiries should be made as to its effect upon the depletion of rural human resources.

PART III

POPULATION AND NATURAL RESOURCES

CHAPTER V

THE OPTIMUM SIZE OF POPULATION

By A. B. WOLFE

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The outstanding feature of current literature on population is the interest it reveals in the potentialities of growth. Biologists and statisticians are vying with one another to show us with what astounding speed the present rate of increase, if continued, would carry us to the physical limit of subsistence. The 'geometrical ratio' has been rediscovered.[1]

One brief but riotous century has doubled the world's population. The total number of people now on the earth is put conservatively at 1.7 billion. At the present rate, numbers double every sixty years. A continuation of this rate would result at the end of each of the next four centuries in populations of 5, 17, 60, and 171 billion respectively.[2] If our own present rate of doubling every five decades were to continue, persons now living would see a population in the United States of 250 million. Unless, therefore, this increase is quickly and greatly retarded, the saturation point is only a few generations off at most, not thousands of years away as is popularly supposed.

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[1] W. S. Thompson, *Population: A Study in Malthusianism*, Columbia University Studies, 1915; chaps. 9 and 10. G. H. Knibbs, 'The Problems of Population, Food Supply, and Migration,' *Scientia*, vol. I, no. XII, 1919; pp. 485–95; and 'The Mathematical Theory of Population,' *Census of the Commonwealth of Australia*, 1917; Appendix A, vol. I; pp. 26–33, 453–56. E. M. East, *Mankind at the Crossroads*, 1923; chaps. 4 and 6; and 'Population,' *Scientific Monthly*, June, 1921; pp. 551–57. O. E. Baker, 'Land Utilization in the United States, Geographical Aspects of the Problem,' *Geographical Review*, January, 1923; pp. 1–26. L. C. Gray, O. E. Baker, and others, 'The Utilization of Our Lands for Crops, Pasture, and Forests,' United States Department of Agriculture, *Year Book*, 1923; (separate) no. 896; pp. 487–506. Harold Wright, *Population*, 1923. J. M. Keynes, *The Economic Consequences of the Peace*, 1920; chap. 2; 'An Economist's View of Population,' *Manchester Guardian Reconstruction Supplement*, section 6, 1922; 'The Problem of Population in its Larger Aspects,' *Journal of Commerce and Commercial Bulletin*, August 29, 1922.

[2] G. H. Knibbs, *The Mathematical Theory of Population*, p. 453.

Much time has been wasted in estimates of the exact number of millions this country can support. Disputation over a few score millions is unimportant, for in the absence of an improbable revolution in agriculture, we shall soon be confronted with the pointed choice of reducing either our birth-rate or our standard of living.

Practically, an essential part of the population problem is to get the people to see that they are confronted with a condition, not a theory. Fixed attitudes and prejudices are hard to break down, and the public is not easily impressed with what it has been taught to regard as at most a remote danger. The American farmer will not soon believe that overpopulation is imminent. There are, moreover, speculative and other interests which profit by population increase. And there are many timid, optimistic folk, dominated by traditional moral and religious sentiment, whose rationalizing proclivities prevent them from facing the issue squarely. To avoid admitting early danger of overpopulation, they institute an imaginary migration to the jungles of South America, or grasp at the straw of synthetic food and intra-atomic energy. It goes without saying that no bank would lend money to a business man whose plans for future solvency were as visionary as those of the optimists who think we need not worry over population increase.

The population problem needs restatement for two reasons: first, because however convincing the calculations of statisticians may be to the adequately informed, their warnings make little popular impression; and second, because we should not be satisfied with avoiding absolute overpopulation. We should aim at a policy which will secure such adjustment between population and natural resources as will enable us to live as well as possible. Even if it could be demonstrated that this country could support 500 million people by eliminating waste and giving up meat, *cui bono?* The standard of living would continue to fall and the problem of numbers continually get worse. The only happy people would be the sword-rattling generals. Those who to-day argue that we can find a way to support double or treble our present population are simply falling victim to our unthinking American worship of size and growth, without inquiry into the human values involved. A sane theory of population should consider these values.

Usually the problem is presented as a 'safety-first' proposition, and it gets no hearing. If the matter were presented as an ever-present problem of efficiency, it would get a hearing. And if a reasonably rational adjustment of population to resources can be obtained, the two problems — that of avoiding overpopulation, and that of securing the highest practicable per-capita economic efficiency — will be solved at the same time.

Fundamentally, the problem is one of factoral proportion — of securing the most efficient numerical ratio between natural resources and labor power, or, more briefly, between land and population. For simplicity of statement, it is here assumed that capital may be regarded merely as a device for increasing labor power.

Given a fixed supply of natural resources and a fixed technique of production, per-capita product must diminish when population increases beyond a certain point. This static law of diminishing returns, more accurately called 'the law of factoral proportion,' is so completely established, both by general experience and by experiment station records, that few persons question it.

But this static law of factoral proportion is useful only as a starting-point in analyzing relations between population and resources. It is based on assumptions contrary to fact. Productive technique is not constant; it is constantly improving. And our natural resources are not fixed; they are constantly decreasing, because we are using up at a whirlwind rate supplies which it took the slow ages to store. Even if, to simplify analysis, we regard resources as constant, it is obviously not easy to predict the exact outcome, at any given time, of variations in the other two factors, population and technique. The endless and mostly barren controversies over the Malthusian theory have been made possible primarily by this highly dynamic quality of the problem. This aspect of the problem is also responsible for much of the incorrigible optimism of those who feel that it is wrong to 'tamper with conception,' and who seem to think that a dense mass of stereotyped beings represents a higher order of good than a smaller number of individuals.

Nearly all these anti-Malthusian optimists rest their case on two misconceptions: they think the earth is a great deal larger than it is; and they believe that 'progress' can work miracles. Migration and invention — these are the two means of escape which they invariably hold sufficient. They see vast empty spaces. The State of Texas, especially, appeals to their imagination. Most of them have never been there. They do not study the rain map, the temperature chart, or contour intervals. They have a naïve faith in mechanical progress. For them, invention will 'set aside' and 'indefinitely postpone' the law of diminishing returns. Progress will find a way. Man is master of his fate. Thus we are invited to soar into the lyrical regions of 'two-story agriculture' and to listen to the music of solar engines throbbing in the white sunlight of the deserts. The chemists will make our food in the laboratories and we can continue to beget unlimited offspring to the glory of God.

All this faith, however, overlooks certain important facts. The essential considerations commonly lost sight of are the following:

(1) Only inferior lands, limited in extent, remain for settlement.

(2) Progress itself involves a paradox, for, as Julius Wolf long ago pointed out,[1] it is inconceivable that technical advance can maintain the pace it set in what Wallace called 'the wonderful century' and which J. M. Keynes thinks may prove to have been 'a magnificent episode' in history. In the main, future improvements are to be 'looked for in the fourth decimal place.' There was a 'pace that killed Athens.' There are reasons for believing that we cannot maintain our own pace.

(3) The engineering and the economic problems are confused. Some things technically possible are possible economically only at prohibitive cost and a lower standard of living.

(4) There is a limit to the degree to which cheapened manufactures can offset increasing costs in the extractive industries.

(5) Per-capita agricultural yield should be calculated on the basis of *all* the labor engaged, both directly and indirectly, in the production of agricultural commodities — as, for example, in the manufacture of farm machinery and fertilizers and in the transport of farm products.

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[1] Julius Wolf, *Die Volkswirtschaft der Gegenwart und Zukunft*, 1912; chap. 6.

If these considerations, which are discussed at length in the next three chapters, were given the weight they deserve, there would be less foolish optimism, and less sentimental and doctrinaire opposition to controlled fecundity. Only by formulating population theory accordingly can we have a rationally economic population policy, that is to say, a policy which will first of all retard growth before we are hopelessly beyond the optimum ratio of numbers to resources, and which will take as its aim the attainment and maintenance of that ratio.

In what follows, the real population problem will be considered to be that of attaining, and maintaining, the most productive ratio between population and natural resources. Productivity is to be measured by the *per-capita* income of ultimate consumers' goods. This ratio is called the *optimum*, and a population of this most efficient size the *optimum population*. Economically, the desideratum is not to wring from the earth the largest possible *total* product, but to obtain, in return for whatever expenditure of effort the people may regard as normal and proper, the largest, permanently practicable, *per-capita* product.[1]

The notion of the optimum is frankly a utilitarian and an individualistic concept. It assumes that the function of the economic process is to serve individuals. The nation may be regarded as a productive unit, but must not be thought of as an end.[1] Doctrines and policies which have in the past sought to encourage unlimited population growth have usually, except in new countries, been based upon political, rather than economic, interests, and have all but lost sight of the welfare of individuals. A realistic population policy must, of course, take into account political facts. Nationalistic sentiments and frictions are to-day undoubtedly the most serious obstacle to a population policy aimed at securing maximum individual income. They counsel a 'safety-first' policy, and safety is supposed to reside in overwhelming numbers. Perhaps the toughest and the most fundamental problem the world has to solve is to harmonize national safety with per-capita efficiency. Economically, this is the basic significance of the problem of international peace.

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[1] The idea of an optimum, though not the term, is very definitely set forth by John Stuart Mill, *Principles of Political Economy*, bk. I, chap. XIII. It appears again in Cannan, *Theories of Production and Distribution*, 1917; chap. 5; and *Wealth*, 1914; p. 68. Implications of it are fairly common in the German literature on population theory; e.g., Julius Wolf, *Nationalökonomie als exakte Wissenschaft*, and *Der Geburtenrückgang*, 1912; pp. 248 ff.; Budge, *Das Malthus'sche Bevölkerungsgesetz und die theoretische Nationalökonomie der letzten Jahrzehnte*, 1912; p. 91. The idea is made a central motif in Carr-Saunders's recent book, *The Population Problem*, 1922; but Carr-Saunders's 'optimum,' which he insists has been maintained by every tribe since Neanderthal man, does not seem impressive, because it is maintained by high death-rates or low birth-rates indifferently. The true optimum must be consistent with the lowest attainable death-rate.

In the absence of an effective method of adjusting international differences, we are, as the world now reasons, caught on the horns of a dilemma. If we do not breed like rats, regardless of economic consequences, we shall be in danger of attack by other, and envious, nations, in which unlimited multiplication will have afforded both a reason and a means for aggression. And if we do so breed, we shall reach the subsistence level in which death will continuously reap a fat harvest without any foreign assistance. Economically, each nation will be caught in a vicious circle. It will have to have a teeming population from which to recruit the cheap labor necessary to retain its foreign markets; and the militant protection of these same markets will be necessary because of the teeming population which will starve if they are lost.

An optimum policy, aiming at the maximum per-capita income, will require, on the contrary, stringent restriction of population growth. This will involve not only a reduced birth-rate, but drastic regulation of immigration, perhaps even virtual suppression. Certain international adjustments and modifications of nationalistic attitudes are bound to be necessary. When a country is at or near its optimum, an exclusion policy is entirely justifiable, for it is no country's duty to take in the surplus children of another. The only ground on which it could be held to be so would involve a serious impairment of sovereignty and a sort of world communism of natural resources. The ultimate result of a policy of unrestricted intermigration, such as popular leaders in some countries demand, would be to reduce all countries to the standard of living of the lowest. Humanity, in every sense of the term, will be best served if each nation is held responsible for the poverty caused by its own sentiments and superstitions.[1] This conclusion involves no assumption, such as frequently mars discussion and clouds the real issue, of hereditary inferiority on the part of any race or people.

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[1] Cf. Duguit, *Law in the Modern State*, 1919.

The whole political and international aspect of the subject needs extended treatment, rather than passing notice, for it is possible that just on this issue of control of migration the wealthier nations may find themselves in a disagreeable position. Japan and Italy, for instance, might refuse to join in any plan for international peace which did not embrace international control of migration.

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[1] Some material on the question of migration and sovereignty may be found in the following: Paul Fauchille, 'The Rights of Emigration and Immigration,' *International Labor Review*, March, 1924; M. A. Carcano, 'La Conferencia International de Roma y la Politica Immigratoria Argentina,' *Revista Economia Argentina*, July, 1924; C. Arena, 'Problemi Internazionali dell' Emigrazione alla Conferenza di Roma,' *Rivista Internazionale*, July, 1924; C. Arena, 'Lo Statuto dell' Emigrante,' *Rivista Internazionale*, October, 1924; E. Rouland, 'Une Conférence Internationale de l'émigration et de l'immigration,' *L'Économiste Français*, August 30, 1924.

Acceding to this impairment of sovereignty, we should have to lower our bars. Not acceding to it, we should have to give ear to the militarists. In either case a rational population policy would be impossible.

There is, therefore, some cogency in Harold Cox's suggestion for a league of low birth-rate nations.[1] An international conference on the population problem ought to be held before long. At the least, it would do no harm to have a few population experts at the next disarmament conference.

Since the central impetus to population policies has in the past been political, and since economists have conceived the problem mainly as one of avoiding absolute overpopulation, the theory of the optimum has not been worked out. The term itself is seldom met with in economic literature.

The first query that will be raised will doubtless be how, in view of the large number of variables involved, we can know when we have arrived at the optimum. The problem is difficult, it must be admitted. But it must be emphasized that even if only the roughest sort of measurement is possible, the ideal of the optimum as the criterion of a rational policy still retains its validity. Various indexes of prosperity might be outlined, but space does not permit. It should be noted, however, that statistics of national wealth, or of net value-product, are of little service. The inventory of wealth may increase without an increase in the inventory of consumers' goods. Monetary value, also, even when stated in terms of an index of stable prices, may increase, with a decrease in actual real income. The fully accurate index of prosperity would be an index of the inventory of consumers' goods produced each year. In the absence of an approximation to such an index, we shall have to rely upon a price index of money income, less savings and reinvestment.

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[1] Harold Cox, *The Problem of Population*, 1923; p. 98.

Once the optimum were attained, the expenses attendant on population growth would be avoided. Additional housing, public utility extensions, and land reclamation would no longer be essential. Increase of land values and rents would be checked. Slower use and decreased waste of natural resources would retard the increase in the cost of raw materials. Distribution of income would undergo some change. Wages would be higher and interest lower. Business would become less speculative. Costs of consumers' goods would tend to fall.

The number of people needed to constitute the optimum population will depend upon various circumstances. The quality of the human stock, the level of health and vitality, and demographic constitution are obvious factors. Both the death-rate and the birth-rate would be lower, and the average length of life higher, than now. There would be more old people, but fewer children below the working age. On the whole, however, the proportion of non-workers might be higher than at present.

The state of the arts is, of course, highly important. Technical improvements may do three things: they may provide new and more refined commodities, they may save labor, and they may for a time offset the tendency to higher cost of raw materials. Generally speaking, a nation may utilize its technical progress either to support more population or to raise the standard of living of the existing population. If invention saves labor, several alternative results may be chosen. The same population with the same per-capita effort can have a larger income. Or they can have the same income with less work. Or, with the same work and the same income, they can elect to increase population. Or, with the same work, a lesser population can have a larger income. Given only rational control of population, the outlook for a high level of per-capita income and culture in the future is exceedingly attractive.

A wise people, preferring more leisure to maximum income, might elect to fix its numbers at a point below the physical optimum. By so doing, they would avoid some of the expense now thrust upon us by increasing density. Some of our so-called utilities are merely devices for mitigating, often inadequately, the discomforts incident to agglomeration. There are also moral losses connected with increasing density, which we may well wish to avoid. Increasing density means diminution of freedom, more intricate and expensive organization, loss of community self-reliance, and the multiplication of centralized and peremptory social controls. It means also — and this is not to be counted lightly — a distinct æsthetic loss, at least to those who do not judge the beauty of a landscape by the amount of corn and hogs raised on it, and who still hope that some of our wild life and wild places may be preserved.

Many obstacles will impede the adoption of a rational policy. International friction and militaristic sentiment have already been mentioned. Hardly less effective are religious sentiment, ignorance, and uncritical optimism. Many people fear birth-control because they are told that it will increase extra-marital immorality. They do not stop to consider whether if this were so (which is open to doubt) it might not be a low price to pay for the moral advance gained by avoiding the hideous immorality of enforced maternity, and by easing that population pressure which bids fair to be a fruitful cause of international discord. Finally, there is the eugenics-Nordic complex.

Few clever phrases have ever been more productive of loose thinking, and of unsubstantiated hypotheses taken as eternal verities, than 'race suicide.'

Practically, the population problem is in large measure a problem in social psychology; for the attainment of a rationally adjusted birth-rate depends upon the attitude of the whole people. If their attitude is to be that of the Roosevelts and the reactionary clergy, the optimum may as well be regarded as a wild and impossible dream. It is probable, however, that the public will understand the idea of an optimum relation between numbers and resources, when it is adequately presented, and that the theory of the optimum can be made the basis for a change in popular attitude toward the danger of overpopulation. Certainly there is ample evidence that, as soon as the mediæval statutes against contraceptive knowledge are removed, the birth-rate will decline, perhaps by the required amount, without further discussion.

Then, with rising standards of living and broadened democratic opportunity, much that the biological eugenists attribute to poor heredity, and the believers in innate Nordic superiority to deficiencies in quality of non-Nordic stocks, will be found to be due to lack of opportunity. The trend of present-day psychology, with its virtual discarding of instincts, and its increasing emphasis on the learning process, marks a change in scientific insight which many biologists and some anthropologists are slow to recognize, but which, to say the least, should make us all wary of accepting uncritically the tradition of innate, organically inherited differences of capacity in races and classes. While, with the advent of a rational policy as to numbers, the problem of quality will not disappear, it will be much less pressing than to many it now appears to be.

The theory of population is, however, in an unsatisfactory state. While the problem is fundamentally economic, it involves many factors which economists often overlook. The essentially psychological element in the problem has been handled crudely by the economists and inadequately by the sociologists. Here statisticians and biologists can be of little assistance. It is too far a cry from fruit flies in a jar to human beings who have had a taste of rational self-direction. There is an implied fatalism in statistical curves — a fatalism unjustified by the underlying facts. We are likely to forget the human motives which lie back of the phenomena summarized in our logarithmic charts. The future trend of a curve can be predicted only if we know these motives and the future changes which they are likely to undergo. But psychological factors are not always predictable. Herein lay the defect of Malthus's analysis. Herein also lies a great defect of current population literature.

One can read the *Essay* from cover to cover without encountering a passage which indicates that Malthus ever thought that women have anything to do with population. Much the same blindness still persists. It is a fault of population theory that it is man-made. This also puts a black mark against traditional optimistic attitudes, and against cameralistic and mercantilistic population policies from Frederick the Great down to our own time. Such attitudes and such policies never count the vital costs of a high birth-rate — the costs to the women of the race. Many economists and most biologists fail to consider this. Yet the very essence of economy is to balance real costs against real income. A valid population theory, as well as a rational population policy, must take account of the way in which half the race, hitherto practically ignored, will probably calculate the costs against the satisfactions of large families. Neglect to consider the interests and attitudes of the potential mothers of the race impairs the objectivity of any population theory.

There are powerful influences tending to perpetuate the dangerous rate of increase — ecclesiastical policy, for example, commercial avarice, and militaristic illusion. But, fortunately, there are equally powerful influences which will retard population growth. The whole movement for a real democracy, the modern woman movement, the universal demand for a more worthy standard of living, the growth of rationalism and of individualism — forces almost unknown to Malthus, because barely started in his time — are factors which no serious student of the problem may overlook. There is evidence that the workers, even the socialists, no longer regard the Malthusian warning as a mere subterfuge of exploitative capitalism. There is abundant indication that women are taking a hand in determining their own population policy. Happily, it is fairly clear that their decision will be in line with what statistical analysis and economic experience show to be essential, either for avoiding absolute overpopulation or for attaining the optimum. The question is whether this harmony of individual and social interests will be allowed to express itself freely soon enough to avoid the unpleasantness which tables of population increase, crop yields, and reserve resources indicate to be lurking just under the horizon.

CHAPTER VI

POPULATION AND AGRICULTURE

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There were about 850 million people in the world in the year 1800; twice that many in the year 1900. It took mankind half a million years to produce the first 850 million and then but a century to double the number. W. S. Rossiter has shown that in the 800 years from 1000 to 1800 A.D., the *white* race increased from about 30 million to 210 million and *in the next 115 years* to 645 million. The gain in 115 years was two and one half times as great as in the previous 800 years.

With the low death-rates of modern nations, a birth-rate of 19 per thousand gives France some genetic increase; while a birth-rate of 26 per thousand forces England to send forth emigrants. Birth-rates above 30 per thousand have been common and still are. During the last century, birth-rates of 40 per thousand have obtained in Europe, the New World, and Japan; while 60 has been recorded. The world's population is increasing at the present time at the rate of 12 million per year. Obviously, Malthus did not seriously exaggerate mankind's capacity for population growth.

Thus far, agricultural production has held its own with population. Never in the world's history did man have so much to eat, so easily and cheaply obtained. R. N. Rew says that for two or three decades before the War, the predominant economic fact was the cheapness of the main necessaries of life, and the steadiness in the world's markets, year after year, of the prices of the chief articles of food.[1] Agriculture during the nineteenth century set for the world an abundant table at low prices.

At first thought, the nineteenth century seems to have overthrown the central principle of Malthusianism, the tendency of population to increase faster than food supply. Though population increased five or six times as fast as during any preceding century, the production of food and raw materials increased even more rapidly. Mankind is better fed to-day than when Malthus first put pen to his *Essay on the Principle of Population.* Was Malthus, then, fundamentally wrong?

Malthus was not wrong. The nineteenth century was an exceptional epoch in the world's history. Vast areas of cheap and fertile land, easily reached and comparatively inexpensive to cultivate, were put under the plough. The new areas which will be brought into use during the twentieth century will require much larger investment of capital and labor to make them tillable, and will, on the average, be of lower fertility. Consequently, though the world is at present more concerned about adequate markets for its farm products than about possible food shortages, the fundamental situation of all history is unchanged. In a Marathon race between population and agricultural production, population must eventually and inevitably win. Science and invention may postpone the day of reckoning, but they cannot prevent it from coming. The only act of society that can avert an approaching pressure of population upon agricultural resources sufficient seriously to check the progress of human welfare is a sharp reduction, in the near future, of the present rate of population growth. W. S. Rossiter has pointed out that 'if the rate of increase shown for the past century by

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[1] R. N. Rew, *Food Supplies in Peace and War*, p. 7.

Europe and the United States combined were to be maintained to 2020, the number of persons of European blood living in that year would reach the amazing total of 1,980,000,000,'[1] some 300 million more white people than the present entire world population — white, black, yellow, brown, and red. What will be the ratio between population and food supply *then?*

Two questions confront us at this point: 'What prospects can we see of expanding the world's agricultural output to meet the needs of additional hundreds of millions of people?' and, 'What are the probabilities of population growth during the next century?' We shall consider the agricultural problem first.

The possibilities of expanding the world's output of farm and forest products depend upon the possibilities (1) of increasing the world's crop acreage, (2) of future tropical agriculture, and (3) of materially increasing production per acre.

The best soils of the earth are already in use. The nineteenth century saw the agricultural exploitation of the world. On every continent and in the islands of the seas, the European portion of the white race has sunk its plough on prairie and hill, upon the mountain-side and in the valley. Agriculture has been pushed to the edge of the Arctic snows, until Greenland, Alaska, and Siberia are yielding to the white man's hand and seed. The white farmer has gone up the Amazon; struck inward from east and west, south and north, toward the heart of Africa; opened up the semi-arid interior of Australia; even penetrated the Orient. He has developed most of South America. Nor have the colored races been idle. The native people of Asia, Africa, and South America are producing more food and raw materials than ever before in history.

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[1] *Journal of the American Statistical Association*, March, 1923; p. 568.

Throughout the world, hundreds of millions of acres, formerly non-cultivatable, have been reclaimed by irrigation, drainage, and fertilization.

Never again will mankind have opportunity to enlarge farm acreage by adding areas like the great plains of Central North America; the rolling, fertile, well-watered forest regions east of the Mississippi; and the portions of South America, Africa, and Australasia which were put under the plough in the nineteenth century. From now on, extension of crop acreage must come through irrigation of semi-deserts, drainage of swamps, reclamation of cut-over lands, conquest of tropic forests, swamps, and jungles, and the ploughing-up of pasture.

There are, however, four areas in which considerable expansion of crop acreage is possible; the United States and Canada, Siberia, Argentina and Brazil, and Central Africa.

There are 1.9 billion acres of land in the United States of which, in 1919, 879 million, or 46 per cent, were in farms and 478 million, or 26 per cent, were actually under cultivation. The area harvested in 1919 was 365 million acres. Careful study of the crop possibilities of the rest of the land area of the United States by our Federal Department of Agriculture[1] revealed the fact that, in addition to the acreage harvested in 1919, there are about 600 million acres in this country which will become physically capable of being used for crops, if we meet the expense of bringing this land into cultivation. These 600 million acres include virtually all the land in the United States that is not too rough, rocky, sandy, cold, dry, or wet for farming, or is not now used for purposes other than agriculture, such as cities, roads, and railways.

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[1] L. C. Gray, O. E. Baker, F. J. Marschner, B. O. Wertz, W. R. Chapline, Ward Shepard, and Raphael Zon, 'The Utilization of Our Lands for Crops, Pasture, and Forests,' United States Department of Agriculture, *Year Book*, 1923; (separate) no. 896.

For a number of reasons, as the Department points out, this estimate of potential crop acreage gives an entirely illusory conception of our potential resources. Most of the 600 million acres would have to be cleared of timber, brush, or stumps, much of it at heavy cost. A large portion consists of light soils that might be used for growing vegetables, fruits, tobacco, and cotton, but could never be of value for staple grains. Sixty-eight per cent of the Nation's swamp lands would have to be both drained and cleared. Only 30 million acres, or 8 per cent, of our Western desert lands can be reclaimed by irrigation. We have water for no more. Some additional arid acreage may be reclaimed by dry farming. O. E. Baker, of the Department of Agriculture, after carefully considering the problem, reached the conclusion that the maximum possible increase of agricultural land in the United States is 47 per cent of our present improved acreage, or less than 250 million acres.[1]

Agriculture in the United States, most authorities agree, is now operating under conditions of diminishing returns. Further extensions of acreage and increased output per acre must be at increasing costs. Most of the rest of the world is in the same situation. Pitkin estimates that the farmers, in order to take care of the annual increases in world population, are now required each year to supply the world with some 23 million pounds more of foodstuffs than ever before. The time is not far distant when the world will have to be fed under conditions of increasing costs.

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[1] O. E. Baker, 'Arable Land in the United States,' United States Department of Agriculture, *Year Book*, 1918; also 'Land Utilization in the United States,' *Geographical Review*, January, 1923.

Canada and Siberia face serious difficulties in expanding their acreages. Both suffer from early and late frosts and early killing temperatures. Canada has some prairie land left, but must incur heavy costs for clearing and drainage on most of the land not already in use. Siberia has much soil which lacks water or is of poor quality, and has pushed land settlement pretty close to its possible limits.

The South Temperate Zone has but a small land area compared with the North Temperate Zone, and much of this is desert. Both Argentina and Australia have undependable climates, with frequent drouths, so that crop failures and shortages are more common than in the North Temperate Zone. Australia has made large investments in irrigation projects during the last fifteen years with results which up to the present time have been very disappointing. The possibilities of increasing food production in the South Temperate Zone should therefore be compared with the agricultural possibilities of the semi-arid portions of the United States between the Mississippi and the Rockies, rather than with those of the country as a whole. Irrigation, dry farming, and the adaptation of new varieties will increase the Australian and Argentine acreages, but their total capacity for food production will never be sufficient for a dense population.

We come now to the tropics. Extravagant optimism and unmitigated pessimism characterize the views of different authorities concerning a region which constitutes one third of the world's land area, and supports — in most cases at a bare existence level — about one third of the world's population. Can the tropics increase their agricultural production enough to afford an American standard of living to their present populations? Can they provide for increased numbers within the tropics? Can they help feed the rapidly increasing industrial population of Europe?

Efficient agriculture requires proper soils, temperatures, and moisture. It also requires competent people. Tropical agriculture, on the whole, enjoys abundant moisture and favorable temperatures. Its chief problems center around the qualities of soils, the costs of reclamation of tropical forests, swamps, and jungles, and the possibilities of human efficiency in hot countries. The tropics have, indeed, large areas of good soil, still uncultivated; but the expenses of reclamation will prevent them from being farmed until food prices are much higher than at present.

In lands like Egypt, where the *fellah* would rather carry dirt in a basket than in a wheelbarrow, because his grandfather a thousand times removed did it that way, where four children in every hundred are blind in one eye because 'Allah wills' it so, and where infant mortality reaches 27 per cent, agricultural efficiency is not likely to reach its maximum.

On the other hand, investigations in Porto Rico, Central America, and other warm countries have shown that much of the inefficiency of their populations has been and still is due to illness, malnutrition, and such parasites as the hookworm. The marvelous development of agriculture in Porto Rico under American management, particularly since Bailey K. Ashford and his helpers cured 500 thousand Porto Ricans of hookworm, is one of the most striking incidents in the world's recent agricultural advance. When we eliminate from the life of tropical populations illiteracy, malaria, yellow fever, hookworm, and similar conditions, we may set free possibilities of agricultural output beyond our present expectations.

The enormous expansion of international trade in foodstuffs during the nineteenth century and the early twentieth has obscured the important fact that, so far as the staple foods are concerned, the world's table is set with products grown near home. Belgium and England are the big importers of food, but they produced more than one half their food before the War, while Germany and France raised approximately 90 per cent of theirs. The United States at present just about balances its food imports with food exports, and consumes ten times as much American-grown food as is shipped to foreign countries. In spite of Europe's small area, great industrial development, and large population, it is the greatest agricultural region of the world. In 1913, 65 per cent of the world's total production of wheat, oats, rye, and barley, was grown in Europe, 90 per cent of the world's potato crop, 43 per cent of the world's sugar, and one third of the world's cattle.[1]

Russia, Canada, and Argentina are the principal food exporters, but Russia now consumes ten elevenths of its production and would consume the rest if her people maintained an American standard of living. Canada and Argentina, which now export one fifth and one third of their agricultural output, will reduce their exports as they grow in population. Eventually, most of the countries of the world must feed themselves, approximately balancing their food imports by food exports.

This fact brings us face to face with our third agricultural problem: What are the possibilities of increasing food production through more scientific and more intensive agriculture? Beyond question, the present extensive wastes of food products by the ravages of insects and of fungi will be reduced. Drouth- and frost-resistant varieties of various plants will extend the areas of their cultivation. Improvements in irrigation and dry farming will increase the productivity of semi-arid land in the United States, South America, the Sudan, and Australia. The acreage yields of our present crop lands will be increased by crop rotations and better fertilization and tillage.

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[1] G. B. Roorbach, 'The World's Food Supply,' *Annals of the American Academy*, November, 1917.

The remarkable achievements attained in particular areas cause many to believe that a much greater agricultural efficiency lies ahead of us. In Argentina, for instance, about one hundred miles out of Buenos Aires, there was a large belt of semi-arid grazing land, such as we are familiar with in our West, worth a dollar or two an acre. But water lay some fifteen feet beneath the surface; and alfalfa planted in this region sent its roots down into the subterranean water supply and changed a sparse pasture into an abundant forage crop. Seven steers are fed fat where one barely existed before. The same thing has been done in Kansas and other States in the Southwest. Intensive potato cultivation in New Jersey increased output to more than three times our National production average, and in Colorado to over five times. There is a carefully cultivated wheat farm in Kansas which raised 53 bushels of wheat to the acre in 1920 and 47 bushels in 1921, or more than three times the average output of this country; although that farm had been cropped with wheat for twenty-six consecutive years!

But the hard-headed agriculturist smiles sardonically upon those who build dreams upon these foundations. Exceptional farmers on exceptional soil may achieve agricultural wonders. Henry Ford, Andrew Carnegie, James J. Hill, and John Wanamaker have achieved wonders, too. But can every business man develop into a Ford or a Carnegie? Can the average farmer ever equal the achievements of the exceptional farmer, or average land the achievement of certain small areas?

A more dependable test of the possibilities of increasing production per acre has been worked out by the United States Department of Agriculture. They suggest that what has been done on large areas farmed with exceptional efficiency be taken as our standard. The Department uses Germany, Belgium, the United Kingdom, and France as the measure of the world's immediate possibilities of agricultural improvement. These four countries, taken collectively, produce about 41 per cent more bushels per acre of seven important crops[1] than does the United States. Just before the War, for instance, the average yield of wheat in Belgium was 37 bushels per acre; in the United Kingdom, 32.4 bushels; in Germany, 31.7; in Canada, 19 bushels. But the United States raised 14.8 and European Russia only 9.5. Even so, the facts point to the conclusion that after a certain average of productivity per acre is attained, probably somewhat higher than that now prevailing in the United States, a marked increase in average products per acre is attained only by a much greater expenditure of labor. 'In these countries the extra expenditure is proportionately much greater than the increase of yield, so that the yield per unit of labor is much smaller than in the United States.'[2] The agriculturally employed population per thousand acres of crop land was 278 per cent greater than for the United States, and expenditure per acre for fertilizer much greater than in this country. Increased output is, then, obtained at more than commensurately increased cost.

If the agricultural output per acre of the United States were increased to equal that of Germany before the War, this would mean an increase of 33 per cent. It is a genuine possibility. In the 1923 *Year Book*, the United States Department of Agriculture expressed the opinion that, for ten crops which occupy nearly 90 per cent of our entire crop area, it will be practicable to increase average production per acre about 46 per cent, 'when economic conditions shall justify the requisite cost of production.'[1]

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[1] United States Department of Agriculture, *Year Book*, 1923; pp. 466, 477.

[2] *Ibid.*, pp. 475–77.

Past experience with efforts to improve agricultural output per acre shows that progress is not so easily attained as some believe, and mention has already been made of the great expense involved in attaining the higher productivity that prevails in Europe. Agricultural education both in schools and farmers' institutions, and by Government bulletins and farm papers, together with aid by the work of our agricultural colleges and experiment stations, has increased the productivity per acre of American agriculture during the last half-century, but the increase has been, for all crops taken collectively, less than 25 per cent.

Considering food alone, as indicated by the total production of corn, wheat, rye, oats, barley, rice, buckwheat, Irish potatoes, sweet potatoes, and sugar, represented in units approximately equivalent to a bushel of wheat, the per-capita production of the total population of the United States, for the year 1849, was 36 bushels; for 1850, 38 bushels; the average for 1866–75, 37 bushels; for 1876–85, 47 bushels; for 1886–95, 44 bushels; for 1896–1905, 49 bushels; for 1906–16, 47 bushels, and for 1916–20, 40 bushels.[2] On the other hand, the amount of machinery on farms, due allowance being made for changes in prices, increased 50 per cent between 1910 and 1920; the quantity of fertilizer used in 1919 was 40 per cent greater than in 1909; 14 per cent more crop land was under cultivation in 1920 than in 1910; and the number of farmers and farm laborers decreased 14 per cent. Evidently, the American farmer is at present developing agriculture through increased use of capital and decreased use of labor, an exactly opposite tendency from that which prevails in Europe. Increasing population may force the use of more labor.

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[1] This question is also discussed in Bernard Astrolenk's *Social Aspects of the Food Supply of the United States*. The annual *Year Books* of the United States Department of Agriculture furnish abundant statistics on the matter.

[2] United States Department of Agriculture, *Year Book*, 1923; p. 469.

We of the present generation should frankly face the fact that we are working under conditions of minimum costs in food production and that our descendants must work under conditions of increased difficulty. Liebig pointed out that the yield of any crop is limited by the amount available of anything indispensable to its production. On some 500 million acres in the United States the limiting factor is water. There is a possibility that a shortage of nitrogen, phosphorus, potash, or other chemicals may limit the production of important crops, or that a shortage of lubricating oil may be a serious limiting factor in the mechanized agriculture which is developing increasingly in this country. The investments necessary to overcome these difficulties must increase the cost of the world's food and raw material supply.

Conclusions

We have now surveyed some of the outstanding facts of the plant trends of population growth and of the world's present agricultural situation. What conclusions may be drawn?

First, that F. A. Fetter was correct when he said that the estimates of those who claim for the United States or for the world an enormous capacity for future population increase, 'evidence a forgetfulness of economic principles and a recklessness of economic consequences'[1] which is dangerous. Attempting to estimate what would be a saturation population for this country, the United States Department of Agriculture reached the conclusion that, assuming 'the extreme economies represented by the pre-War German standard of food and timber consumption, and allowing for the maximum economies in production shown to be possible by European experience, a maximum population of 350 million is indicated for the United States.'[2] Notice the conditions — the extreme economies in consumption practiced in Germany before the War, and the maximum efficiencies of agricultural production attained in Germany, France, Belgium, and the United Kingdom, taken as a group. Modifying these conditions — that is to say, assuming an American standard of living and assuming that our agricultural output per acre was increased one third instead of the 46.8 per cent of this estimate — our saturation population would fall far below 300 million. Even if the waste and unnecessary luxury of American habits of consumption were eliminated, our saturation population would not be far above or below 300 million.

Enthusiasts who declare that 500 million people will be able to live in the Mississippi Valley and 300 million west of the Rockies will find little encouragement for their dreams in a systematic survey of the food-producing powers of the United States or of the rest of the world; for though the earth's physical capacities are far from being taxed to the limit, it is questionable whether a high civilization can be maintained if food prices have to be increased enough to permit farmers to expand production to its physical limit. Of course, if the efficiency of manufactures and commerce can increase fast enough to keep the incomes of the industrial population abreast of the cost of living, increases in price may continue for a considerable time without endangering standards of living and without checking population growth. These conclusions are all based, of course, upon possible improvements visible at the present time.

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[1] F. A. Fetter, 'Population or Prosperity,' *American Economic Review*, March, 1913; p. 10.

[2] United States Department of Agriculture, *Year Book*, 1923; p. 497.

I cannot estimate what a saturation population for the world would be. Japan, China, Java, India, Egypt, Belgium, Holland, Italy, Germany, the United Kingdom, and some other portions of the world, appear to have reached the saturation point already.[1] The essence of the matter was well stated by a Japanese student: 'In America any one who works hard can earn a good living; in the Old World, it is not possible.'

In none of these countries do the masses now enjoy a standard of living which equals that of the United States. In some, the population seems to be more dense than can possibly be supported at an American standard of living, especially if cheap foods can no longer be imported. Some will probably decrease in population, particularly if world peace decreases the military motive for density of population. But if present rate of population increase continues, the twentieth century will see the rest of the world populated to the saturation point, unless remarkable improvements in agricultural and industrial technique set back the process of diminishing returns. If immigration legislation prevents the surplus populations of the older countries from migrating to the food supplies of new countries, the old countries will be forced to check population growth, and the time when the saturation point will be reached in the new countries will be postponed.

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[1] There is some difference of opinion concerning whether or not Great Britain's population capacity has been reached. At any rate, England is not far from her saturation point.

'Before the progress of population is finally stopped,' said Malthus, 'the real wages of labour must have been gradually diminishing till, under the existing habits of the people, they could only support such families as would keep up, and no more than keep up, the actual population.'[1]

France is the only Western nation in which this process has worked itself out; but instead of being the result of falling real wages, as predicted by Malthus, the stabilization of population in France seems to have been due at least partly to rising real wages. I have an idea that the process has worked itself out by the Malthusian route in China and India.

France probably exemplifies what is going to happen during the twentieth century in many lands. France has merely arrived first. Real wages went up during the nineteenth century in Western Europe and America. A higher standard of living was made possible, and the world's masses were awakened to new and rapidly expanding desires. The first effect of the increased ease of livelihood was the sharp increase in the birth-rates that characterized the early and middle nineteenth century. This was followed by lowered death-rates during the middle and latter part of the century, and then by a downward turn of birth-rates in all of Western Europe.

The birth-rates of the various European nations reached their peaks between 1860 and 1890, except in France, where the peak was attained before 1850. Bulgaria and Roumania were the only European countries which had higher birth-rates in 1910 than during previous decades, and recent data suggest that both these countries are at their turning-points. The birth-rate of Hungary decreased from 44.6 per thousand in 1881–86 to 37 per thousand in 1909; that of Prussia, from 37.4 to 31.8; Italy, 38.0 to 32.4; England, 33.5 to 25.8; Scotland, 33.3 to 26.4; France, 24.7 to 19.6; an average decrease of 6.4 in the annual birth-rates per thousand of population; or of about 18 per cent, figured on the 1881–86 birth-rates. (See Figure 9, p. 299).

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[1] Robert Malthus, *Principles of Population*, book III, p. 387.

But, because death-rates also were falling steadily, the rate of natural increase actually rose during these years in Hungary, Prussia, and Italy. In Scotland, England, and France, the rate of increase of population declined only 8 per cent, although the birth-rate fell.

But during the years just preceding the World War, the British Isles, France, Victoria, and South Australia reached the point in their population history when the rate of natural increase definitely turned downward. In these countries, the time seems to have come when the birth-rate is falling more rapidly than the death-rate. It will probably continue to drop until it approaches the 19 per thousand already reached in France.

Birth statistics for the United States are not available for sufficient periods to make satisfactory comparisons. The data we have indicate that the same process is well under way among the native-born population of this country and is spreading to our recent immigrant population.

In many nations, therefore, the rate of population increase will, in my judgment, drop steadily during the twentieth century. Birth-rates will probably decrease faster than death-rates, and the result will be to slow down the rate of genetic increase. The cause for this change from the nineteenth-century population trend will not be the biological 'law' enunciated so confidently by Raymond Pearl, which seems to me to be merely a restatement of Malthusianism, nor the fear of starvation, but the pressure of increasing costs of living upon the modern world's standard of living. We have to-day populations which are better educated than in previous generations; populations ambitious for personal comfort and advancement, stimulated by a taste for the better things of life; populations which have already signified for over half a century their willingness to reduce their birth-rates in order to furnish a higher standard of life for such families as they have; populations conversant with birth-control. As these are forced to resort to poorer and poorer lands and more expensive cultivation to obtain adequate food for their increased numbers, and as they find the necessary costs of food steadily rising, they are likely to check population growth as sharply as may prove necessary to maintain a twentieth-century civilization.

CHAPTER VII

AGRICULTURAL CAPACITY AND POPULATION INCREASE

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The efficiency of farm production may be adjudged by outturn per area or outturn per man. With increasing population, the agriculture of a country passes from maximum outturn per man to maximum outturn per area. Operative practices differ in the two types of agriculture. To look forward to the time when the transition from one type of agriculture to the other may be expected to occur in this country would constitute an inquiry so speculative in technical matters as to prove unfruitful for our present purposes. In the more direct sense, a discussion on increasing the efficiencies of farm productions might be resolved into a catalogue of technical agricultural procedures. Such a statement also would prove unfruitful for our present purposes.

Let us, instead, limit the discussion and phrase the inquiry: What efficiencies of farm production in the United States will ensure the stated food supply of a stated population at a stated future time? With the task thus defined in terms of subsistence requirements, appraisal of the requisite agricultural productions becomes possible.

Population and diet

In the stated future population, Pearl's computation is used; it is assumed that the population of continental United States will be 175 million in 1980.

Agricultural practices to be considered shall be restricted to procedures actually known to be practicable. It is, indeed, possible to stimulate plant growth by artificial illumination, by increasing the concentration of carbon dioxid, by maintaining a balance of nutrients, by the use of catalysers, and in other ways. It may sometime be possible in factories, by chemical synthesis, to convert inorganic elements into foodstuffs. But all such hypotheses are omitted; this discussion is limited to results possible to farmers of average powers and intelligence, aided by such improvements as may reasonably be anticipated during the next half-century. Unless otherwise stated, all statistical data are from the United States Department of Agriculture, and all figures are rounded, or approximations.

The future diet or ration of the people must be competent in the nutritional sense, adequate to support physical work, sufficiently diversified to meet the tastes of the population and to utilize the products of the different soils and climates of the country, and fashioned after the customary diet, taking into account the trend of the National dietary.

A gross food supply of 3500 calories per person per day is luxuriously adequate to cover the needs of the population and allows for a waste of 500 or 600 calories per day, which may be salvaged as population and costs of food increase.

The ration is divided:

	CALORIES
Milk	550
Cereals	1300
Meats	600
Vegetal oils, nuts, fruits and vegetables	600
Sugar	450
Total	3500

These figures give a supply of milk, cereals, and sugar equal to the present. The meat ration, though somewhat lower than customary, compares favorably with that of the United Kingdom and Germany before the War. Vegetal oils are slightly above the present intake. Fruits and vegetables, including white and sweet potatoes, peas, and beans, are about as now. Game and fish supply from inland, coastal, and ocean waters are disregarded. Poultry is considered a per-capita constant. The diet is reasonable both in the light of previous custom and from the standpoint of nutritional science. If the people of the United States in 1980 have as good a diet as the ration sets up, the gross food supply, properly conserved and distributed, will be fully adequate for growth, maintenance, and physical work, without deficiency diseases, in a population whose longevity will have been increased through control of bacterial and industrial diseases. The specific purpose of this inquiry is to ascertain with what demonstrated improvements in current agricultural practices the United States would be able to secure this food supply.

Relation of diet to type of agriculture

The feeding power of the land depends upon the people's diet. The crops of 1924 would support 20 million horses (allowing them pasture forage and 1000 pounds of grain per head per year), and furnish a generous and diversified vegetarian diet for over 300 million human beings. The same crops would provide a correspondingly generous lacto-vegetarian diet for 250 million people. Probably 60 million acres have recently been used to produce our exported foodstuffs, so that the present agricultural produce would sustain 135 million of our own people on the present diet. In the 1923 *Year Book* of the

Department of Agriculture, using the German diet as a standard and employing European agriculture as a measure of efficiency, it was computed that the United States could sustain a population of from 300 to 350 million people, an estimate that agrees with a previous figure suggested by East. The difference between 175 and 300 million people indicates the leeway within which changes in the diet and in agricultural practices may operate.

Closely scrutinized, the problem resolves itself largely into the relative efficiencies of production of primary and secondary foodstuffs. The conversion of edible primary foodstuffs into edible animal products is a wasteful process in terms of energy, but when inedible products of the soil are converted into edible animal products, there is gain to the human population. A diet consisting entirely of animal products would require the maximum acreage per head of population; a diet restricted to primary edible products of the soil (including animal products secured from crop residues, wastes, and vegetation not fitted for human consumption raised on land not adapted to edible crops) would involve the minimum land requirement. Between the two extremes are the numerous gradations to be observed in the different peoples of the world, depending upon concentration of population, characteristics of soil and climate, and the natural or advantageous diversification of crops. Before the War we raised and used for domesticated animals some 540 calories of feed for every 130 calories consumed by human beings.

The most efficient adaptation to meet food shortage consists in changing the proportions of primary and secondary foodstuffs in favor of the primary. By this means, in part, the warring nations were able to obtain their food supplies during the late War, though a programmed adaptation is difficult either as a short-time or long-time process. To a limited extent, this adjustment is automatic. When feed prices are high, farmers reduce their herds. The liquidating sale of animals increases the supply of meats directly and of edible cereals indirectly. This is the spontaneous response of the rural community to price; and war experiences seem to indicate that it cannot be secured except spontaneously in response to price. The long-time adaptation, the gradual increase in consumption of primary foodstuffs and decline in consumption of secondary foodstuffs, especially meats, is a trend in the development of the world's dietaries which comes with increasing population and the exhaustion of virgin land. This also is an adaptation in response to price, though it is somewhat influenced by education.

The extent to which the agricultural resources of the country are employed for purposes outside the production of primary foodstuffs is well known but not adequately evaluated. Only 30 per cent of the area of the harvested crops of the United States is employed for primary foodstuffs. Even in a country as densely populated as Germany, where one might expect a high utilization of land for primary foodstuffs, 60 per cent of cereals and potatoes go directly to seed, animals, and industry; when allowance is made for the grain offal, the proportion used as primary foodstuffs is reduced to 33 per cent. In the United Kingdom, only 30 per cent of the grain supply goes to the human population. With increasing population, land is saved by reducing the proportion of meat in the diet, increasing the efficiency of meat production, and enlarging the use of primary foodstuffs; and a small shift in the diet represents a large change in agricultural practice.

It is assumed that the United States will have ceased to be a food-exporting country. It is not assumed that we shall become a self-sufficient State in the sense of importing no food. Imports of coffee, tea, cacao, spices, and other tropical specialties will continue. It is also assumed that we shall continue to import sugar from Porto Rico, the Hawaiian Islands, and Cuba; and that we shall continue to import vegetal oils for industrial purposes, and thus add indirectly to the food supply, since, with modern chemical technique, inedible industrial fats and edible food fats are substitutable over a considerable range.

According to the Fourteenth Census, the land in farms was 955 million acres, improved land 503 million acres, and land in harvested crops was 375 million, and we still have about 300 million acres suitable for crops. Apparently, about one third of these 300 million acres might be used for harvested crops; but most of it need not be invoked.

Let us now consider particular items of the gross food supply.

The primary foodstuffs

Cereals. The 1300 calories per day allotted to cereal intake might reasonably be divided into: wheat flour, 240 pounds per person per year; corn products, 40 pounds; and all other cereal products, 20 pounds. With current methods of extraction, this would correspond to 960 million bushels of wheat, 160 million bushels of corn, and 80 million bushels of other cereals. It is assumed that we shall continue to use white flour and convert the mill-feed into milk.

To furnish 960 million bushels of milling wheat, the crop in years of average quality would need to be 1130 million bushels; and to raise this regularly would require, at present yields, the planting of some 80 to 85 million acres and the harvesting of some 75 million acres. It is, however, impossible to believe that the present deficiencies in wheat-growing in the United States will persist through the next fifty years. Seed and strain selection, fallowing, rotation of crops, improved cultivation, perfected methods of harvesting and storing have resulted over and over again, on individual farms in different parts of the country, in yields of wheat one third, one half, and even more above the average.

Even now, yields in a number of States with diversified agriculture are regularly over 20 bushels to the acre, and in Western European countries nearer 30 bushels. Our knowledge concerning wheat pests is already sufficient gradually to ensure their effective elimination. If the practices of wheat-growers in general could be raised to within speaking distance of those of experiment stations, the average yield under normal climatic conditions would exceed 20 bushels to the acre. At 20 bushels to the acre, the wheat acreage would not exceed 65 million acres for the stipulated crop. The anticipation is justified that, with cessation of exports, the increase in wheat required for an increase from the present population to 175 million will be attained, not through more acreage, but through greater yield per acre. Moreover, better wheats yield more flour to the bushel.

The 160 million bushels of corn and 80 million bushels of other cereals in the diet of 175 million people in 1980 represent an increase in the acreage of these grains at present used as food; but the amount is insignificant compared with that used for raising feeding stuffs. We must bear in mind that, because corn is a rotation crop, we have in the United States not much over 100 million acres that can be used in any single year for corn of present type.

Sugar. The figure for sugar in the predicated ration amounts to 91 pounds per person per year, slightly lower than at present, but above pre-War consumption. For a population of 175 million, this would require 8 million short tons. Of this amount, we expect half to be secured from our insular possessions.

The areas in the United States suited to the sugar beet could easily produce 3.7 million tons. The problem of raising sugar beets is only secondarily a problem of land; it is primarily a question of labor, water, disposition of factories, and relation to diversified agriculture. The solids of the plant after removal of the sugar (apart from molasses and industrial by-products) go to the soil as fertilizer and to animals as feed. Raising sugar beets ought not to be one-crop farming, since, when raised in rotation with other crops, the soil is improved.

Much remains to be done toward increasing yield in tons and sugar content. At present our average yield is 10 tons to the acre with 13 to 14 per cent of recovered sugar. Tracts more efficiently cultivated yield to the acre 15 or 20 tons with higher sugar content. It ought, therefore, to be possible within the next half-century to obtain 3500 or possibly 4000 pounds of sugar per acre. The acreage required, even at present yields, for 3.7 million tons of beet sugar is so small as to be virtually negligible for the whole United States.

Fruits and vegetables. The present consumption of fruits, vegetables, vegetal oils, and nuts seems to be about equal to the hypothetical ration, 600 calories, so that the yield of these would not need to expand over 40 per cent. It is assumed that all cotton seed not saved for the next crop would be crushed for oil and meal, and none used for fertilizer. Estimating the cotton crop in 1980 at 15 million bales, with cotton seed, corn, and soya and peanut oils, we have a wide leeway for edible vegetal oils.

Fruits and vegetables involve a specialized agriculture, with intensive cultivation, the use of fertilizers, and, often, irrigation. Both are high-cost products, requiring skilled labor and careful selection, packing, and marketing. But the yields and the returns are heavy per acre, in tons if not in calories. The expansion of the marketing, distributive, transportational, and terminal facilities would be a heavier task than adding the acreage necessary for the expansion.

The secondary foodstuffs

Milk. The present gross milk production is in the neighborhood of 930 pounds per person per year. Pearl estimated the pre-War utilization of gross milk as human food at 95 per cent of the energy of the fat and half the energy of the protein and sugar. Post-War estimates suggest a somewhat larger figure for milk fed to animals and wasted. But every year there is less wastage of skim milk, due to use in various prepared foodstuffs. Two hundred and twenty calories per pound is reasonable for the human food value of the gross milk production. This would make the present ingestion of milk 550 calories per person per day, and this figure will be used for the future population.

There were 25 million milch cows in the country at the last Census and the gross milk production approximated 103 billion pounds, or 4100 pounds per animal per year; but the figure is now nearer 4500. Since these cows give all the way from 30 thousand pounds down to nothing, increase in the milk supply is to be sought rather in improved secretion than in augmented numbers. The maintenance requirements for cows of the same body weight in comparable environments are relatively constant. If the cows of the country were three fourths full-bloods of any of the recognized milking strains, the average milk production would be much higher than at present. With the maintenance feed requirements relatively constant, improvement in secretion capacity through selection and breeding gives a continuously higher ratio of milk calories to total feed calories for the life of the animal. The gross milk supply required for the population of 175 million people would require 40 million cows of the present milk-giving capacity. If, however, the average secretion per cow could be increased to 6000 pounds per year — the figure already generally attained in Holland, Switzerland, Denmark, and the United Kingdom — 29 million cows would suffice, with only a relatively small increase of fodder. In the light of what has already been done in the selection and feeding of milch cows, a gradual improvement during the next fifty years from 4100 to 6000 pounds annually seems a reasonable expectation.

Meat. The food values of meats are taken at 950 calories per pound for beef carcasses, 1200 calories per pound for mutton and lamb, and 2450 calories per pound for pork, including the edible lard. Six hundred calories in meat products per day may be obtained from 50 pounds of beef, 6 pounds of mutton and lamb, and 64 pounds of pork and lard per person per year.

Beef. Of the average of cattle of all ages alive on January 1st of each of the last five years, 32 per cent were slaughtered annually; and the average yield of dressed meat (including veal), not including edible parts other than meat, which are held to balance inedible portions of the dressed carcass, was 340 pounds. The average annual yield of carcass meat per census head per year was, therefore, about 110 pounds. When one considers the acreage devoted to all cattle directly and indirectly, this figure of net return per head illustrates clearly the well-known inefficiency of meat cattle as food producers.

The average consumption of beef and veal in the last reported five years was 68 pounds per person per year. This, compared with pre-War consumption, is 4 pounds above that of the United Kingdom, 30 pounds above that for Germany, and 21 pounds above that for France. However, we must expect to eat less meat than we did in the earlier days of cheap land and open range; so that 50 pounds of beef and veal annually, carcass weights, is reasonable for the future. This, for a population of 175 million, amounts to 8750 million pounds per annum. If we assume that the annual outturn of meat per census head remains the same, this would require a cattle count of 79 million in 1980.

Every decade, however, shows an improvement in efficiency of meat production. The selected meat strains are demonstrably more efficient as converters of cereals into meat; they lay on flesh faster and give a higher return per unit of food. With selected stock it is possible to bring the animal to slaughtering weight in a shorter time and with a considerable saving of nutrients. Baby beef is the beef of the future, and the cost of production, in terms of feed, is notably lower than with two- and three-year-old steers. Advances are also being made in growing better for age on lands not well adapted to cereals. All factors considered, it seems reasonable to assume that fifty years from now census cattle will produce 130 pounds of meat per year instead of the present 110 pounds. Using this figure, the cattle required to furnish 50 pounds of beef and veal per year for a population of 175 million people would be 68 million, little above the present count.

Pork. The average number of hogs in the country during 1920–24 was 63.5 million (census of January 1st); the average number of hogs slaughtered was 68 million. The average return in dressed carcass and lard was 170 pounds per animal slaughtered, or 179 pounds per census head. The average consumption of pork and lard during the past five years was nearly 90 pounds per person per year. Hog counts, slaughterings, and returns fluctuate rather widely from year to year.

Although hogs compete with human beings for the products of the soil more than do cattle, on the other hand they have a considerably higher efficiency in return of meat per unit of feeding stuffs. The hog industry, however, is inefficient in two respects.

In the first place, hogs are selected and fed too largely for lard rather than for meat. The lard competes directly with vegetal oils of identical food value. Plants convert water and carbon dioxid into fat directly, by means of solar energy. Lard involves the less efficient, indirect conversion from plant starch. It is significant that we produce lard in large quantity for export, and fabricate vegetal lard substitutes for home use.

In the second place, the hog industry is inefficient because of the small proportion of animals brought to maturity, the average litter being reduced to 3.5 pigs through disease, exposure, and underfeeding. Evidently, an increase to 5, or even to 4, would notably enlarge returns.

Present consumption of pork in the United States is 90 pounds per person per year. The lowest figure that we have is 71 pounds for 1910 and 1917. Pre-War consumption was 74 pounds in Germany, 40 pounds in the United Kingdom, and 37 pounds in France. From the nutritional standpoint, 90 pounds is luxury consumption, which conditions will pretty certainly not warrant fifty years from now.

I have set the future allowance at 64 pounds per person per year. Using the return of meat and lard per animal that has been the fact during the last five years, a population of 175 million in 1980 will require approximately 66 million pigs, which was the count in 1924.

Mutton. On the average, during the last five years, 15.2 million sheep and lambs (mostly lambs) have been slaughtered for consumption, or 38 per cent of the count on January 1st. Dressed weight averaged about 37 pounds, so that each census sheep furnished 14.5 pounds of mutton and lamb. The per-capita annual consumption of mutton and lamb in recent years has been about 5.5 pounds.

We have had over 60 million sheep in this country; we have less than 40 million now, though a sheep census is inaccurate. There are, however, good reasons for expecting the sheep industry to reëxpand. Lamb is gaining in popular favor. In spite of technical successes in fabricating wool substitutes, there is a notable scarcity of certain grades and qualities of wool. The wool consumption of the country has remained rather constant over a long period, and it may be expected to continue at this level.

Sheep subsist to a large extent upon forage unadapted to cattle and hogs, so that a few sheep find an unobtrusive place on most farms. In some sections of the country sheep will be kept primarily for meat, with wool as the by-product; in others, meat and wool will be equally remunerative; over large areas of the West, wool strains will be employed, with meat as the by-product. Six pounds of mutton and lamb per person per year seem reasonable for the future; and using the present outturn, 175 million people will require 70 million sheep.

Comparison of meat rations. Fifty pounds of beef and veal, 64 pounds of pork and lard, and 6 pounds of mutton and lamb give an annual intake of 120 pounds of what the English call butchers' meats. The following table presents comparisons in terms of pounds per annum.

	BEEF	PORK	MUTTON	TOTAL
United States — present	68	90	6	164
United States — future	50	64	6	120
United Kingdom — pre-War	64	40	29	133
Germany — pre-War	38	74	3	115
France — pre-War	47	37	7	91

Our annual per-capita consumption of poultry, eggs, and fish is probably about 30 pounds. All these, added to the milk supply, make the animal proteins ample from every point of view. The proteins of the meats, milk, and cereals taken together are adequate quantitatively and qualitatively, with allowance for faulty distribution in different classes of society.

Expected agricultural expansion

Let us now compare the present number of domesticated animals with those estimated to be necessary to provide the stipulated ration for a population of 175 million in 1980. Horses we shall regard as constant, since against the future enlargement of acreage we may set the future development of mechanical traction. Probably 5 million more cattle and 40 million more sheep would be required; the count of swine would remain the same. As efficiencies are attained, the per-capita figure for animals will decline.

Each animal unit (animal unit equals 1 head of horses or cattle, 1 of hogs, 12 of sheep) now requires about two acres in harvested crops. Twelve million additional animal units would therefore represent some 25 million additional acres at present yields; but with a 10 per cent increase of efficiency in yield in the next fifty years, the acres now devoted to animals would carry the estimated number.

The additional acreage necessary for the additional wheat, coarse grains, and other primary foodstuffs previously discussed, could not be over 25 million acres. With increase in yields of 20 per cent in the next fifty years, the projected population could be carried on the present acreage.

Under the stated considerations, therefore, 50 million acres would be the outside figure to be added for harvested crops. At the last Census, the land in farms was 503 million acres with 365 million acres in harvested crops. About 20 per cent of this was devoted to primary human foods, 10 per cent for industrial materials, and 70 per cent to harvested forage crops. Live stock now consumes all the products of unimproved land and three fourths of the products of improved land.

We have something like a billion acres of pasture-like land of all kinds; but, although four times the acreage of land harvested for forage crops, it produces less feed calories. But meat made on pasture costs much less than meat made on harvested crops. Five hundred and eighty-seven million acres of pasture are semi-arid and range, and furnish only one sixth of the feed needed by live stock. Of 480 million acres of forest range, only half are in pasture. Humid pasture, of which we have some 335 million acres in farms, ranges, and forests, has from five to ten times the feeding capacity of ordinary semi-arid and forest range pasture. We have some 600 million acres fit only for grazing. Grazing land, whether humid, sub-humid, or semi-arid, in forest, or in farms, is, however, susceptible of improvement through the planting of better grasses. It is probable that the efficiency of pasture production will be increased 10 per cent in the next fifty years, and in some areas more, depending on the extent of governmental operations in reclamation and drainage.

We have some 230 million acres not now used for crops, pasture, or forest (half in farms and half outside), half of which is adapted to one of the three. Apparently, we always have in farms some 40 million cultivatable acres that are not in use, of which the larger part ought to be brought into rotational cultivation. Probably 100 million acres of humid, sub-humid, and semi-arid land can be converted into improved pasture land. Probably one fourth of the sub-humid and semi-arid lands (together 170 million acres) are adapted to dry farming.

From these data it is clear that, with efficiencies reasonably to be anticipated, it ought to be practicable to transfer 50 million acres of pasture land to the use of harvested crops and to replace the pasture land thus transferred. The mere shifting of pasture land to harvested land — also of unimproved pasture land to improved, and of unused, unimproved pasture land to used — in itself presents few difficulties. The crux lies in a different direction, namely, in forest-product requirements. The past development of American agriculture was not inspired by concern over the food supply for country or world; the future development will not be the result of concern over the domestic food supply.

The future exigency for the time and population specified is not scarcity of human food nor yet scarcity of animal feed, but scarcity of lumber, paper, and fibers. Pressure on the future domestically grown food supply will not come from the 160 to 170 million animal units and the 175 million human beings, but from industrial demands for wood, paper, and fibers, which compete in part directly with harvested crops, in part indirectly with forage crops. With the present per-capita consumption of lumber and paper, a population of 175 million would need to put almost our entire land area into forest. The century-old conflict between the plough and the pasture has now become a conflict between the plough and the saw. Substitutions for lumber, paper, and fibers are being rapidly developed; but the demand seems to advance at least as fast as the supply.

When the ultimate population of the United States reaches 200 million, one does not see how the country can raise the desired primary foods, domesticated animals, lumber, paper, and fibers. But it is not the dietary standard that makes the pressure; it is, instead, the standards of our social and industrial living. When to the future problems of lumber, paper, and fibers, we add those of fuel and the metals, direct difficulties with the food supply would appear to be so simple as to be relatively negligible.

CHAPTER VIII

MINERAL RESOURCES FOR FUTURE POPULATIONS

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The immediate outlook for mineral supplies in the United States is encouraging. The ultimate outlook is discouraging. For the immediate future our resources are sufficient to support an increasing population at a rising standard of living. But they are apparently not sufficient to support permanently even our present population at present standards, unless science should discover some source of energy not now available.

Agricultural and forest lands can be reckoned as permanent capital, which with due care may be kept intact. It is, then, possible to compute the population they will support permanently in a given state of the arts and at a given standard of living. But the population that can be permanently supported by the mineral resources of the same country defies calculation. The coal fields of the United States, for example, could easily supply double our present population for a time, but they could not supply permanently the present demand of New England alone. So far as the mineral resources are concerned, therefore, it is necessary to distinguish sharply between the immediate and the ultimate results of a further increase in population.

The immediate outlook

For the immediate future, it is clear that an increased number of people in the United States can be provided with an increased per-capita supply of the essential minerals, either through domestic production or through imports from well-established sources abroad. The resources of North America are both rich and varied, and in comparison with those of Europe they are far from exhaustion.

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[1] Published by permission of the Director of the United States Geological Survey.

The value of our mineral exports far exceeds that of our mineral imports. We lead the world in the production of iron, copper, silver, aluminum, zinc, phosphates, sulphur, and coal, and rank high in vanadium, quicksilver, molybdenum, arsenic, and magnesite. Of most of these minerals we have reserves sufficient to increase our present output for a time; and though the total reserve in the ground, whatever it may be, has been depleted by past operations, the work of prospecting and development has proceeded so far that the tonnage of these minerals actually blocked out and proved was probably never greater than now. The tin, nickel, manganese, chrome, graphite, antimony, mica, potash, and nitrates that we import are offered to us in larger quantities than we care to buy. Of the principal minerals the only ones concerning which there is doubt as to where our next increment in supply is to come from are lead and petroleum.

Moreover, our competitive position is strong. No other country is more nearly self-supporting in minerals; and in no other country can the mineral raw materials as a whole be delivered to manufacturing industry at lower prices. But the very richness and extent of our mineral reserves tend to hinder the adoption of any policy to restrict population, because of the natural desire of the owners of mineral deposits to secure labor for their exploitation.

The outlook for the immediate future may be stated with assurance. Increased supplies of the essential minerals — except, possibly, lead and petroleum — may be had at no great increase in cost.

The ultimate outlook

The long-time outlook is less easily stated.

The world's consumption of minerals has been growing

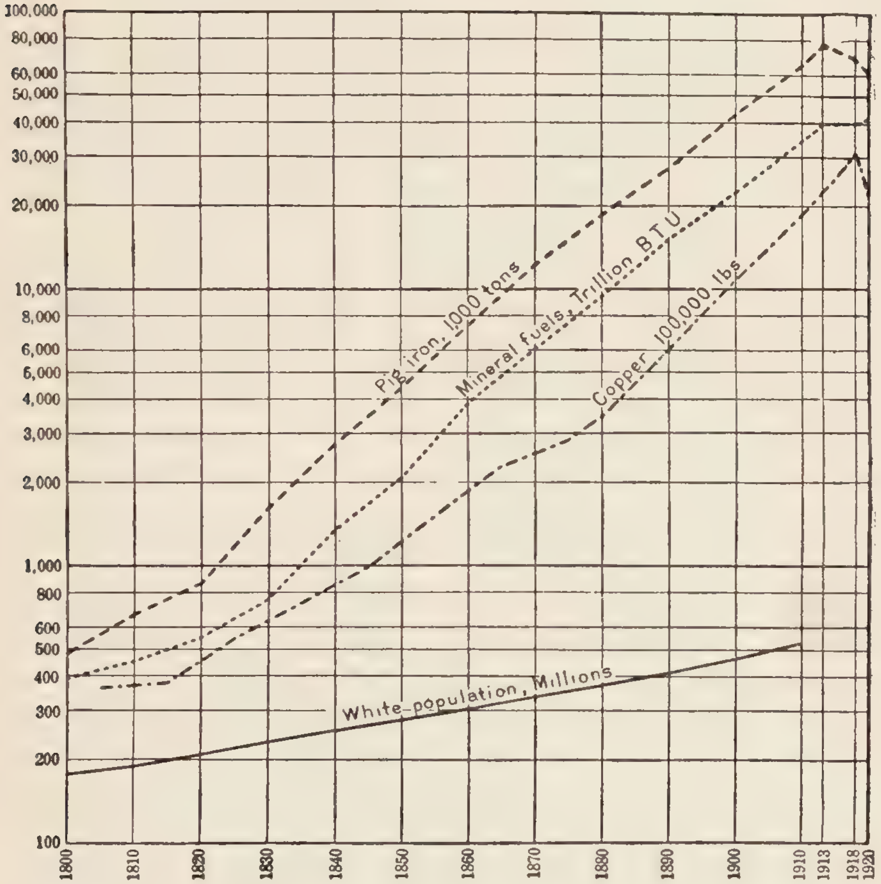

FIGURE I. RATE OF GROWTH OF WHITE POPULATION OF THE WORLD AND OF PRODUCTION OF PIG-IRON, COPPER, AND THE MINERAL FUELS

For lack of information the data for white population exclude the Balkans, Turkey, Asia, Africa (except for British South Africa) and South America. They include the colored population of the United States. The data for mineral fuels include petroleum, natural gas and coal reduced to their heat values in British thermal units; they exclude China, for which no data on production are available in the early part of the period. Subject to revision.

by leaps and bounds. In the hundred years from the close of the Napoleonic Wars to the outbreak of the World War, the white population of the world increased threefold, but the output of tin increased 26-fold, of copper 63-fold, of the mineral fuels 75-fold, and the output of pig-iron over 100-fold. Lead and zinc showed a corresponding increase. In 1815, aluminum and the ferro-alloys (nickel, vanadium, tungsten, manganese, and chromium) were known, if at all, only as curiosities. The mineral fertilizers also are a development of the nineteenth century. Rock phosphate was first used in 1843; sodium nitrate was a contribution of the Western Hemisphere; and before the Stassfurt deposits were mined in 1870, the chief source of potash was wood ashes.

The growth of mineral consumption in the United States has been even more rapid. In the last twelve years we produced as much copper as in the entire sixty-seven years preceding. The output of iron in 1923 was twice that in 1903, and four and one half times that in 1883. The output of bituminous coal grew steadily before the War at the rate of 17 million tons a year.[1]

This extraordinary increase in the rate at which the world drew upon its reserves of minerals was an essential factor in the rising standards of living of the last century. From 1815 to 1915, there was a remarkable increase in per-capita wealth and a decrease in the hours of labor. The change was the result of many factors. Corporate organization, the banking system, thrift, transportation, science and invention, the opening of new agricultural lands, were all factors and each was in a sense responsible for the result. But included in the equation there was also the factor of accelerating use of the world's mineral

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[1] F. G. Tryon and Sydney A. Hale, *Coal in 1922*, United States Geological Survey; p. 482.

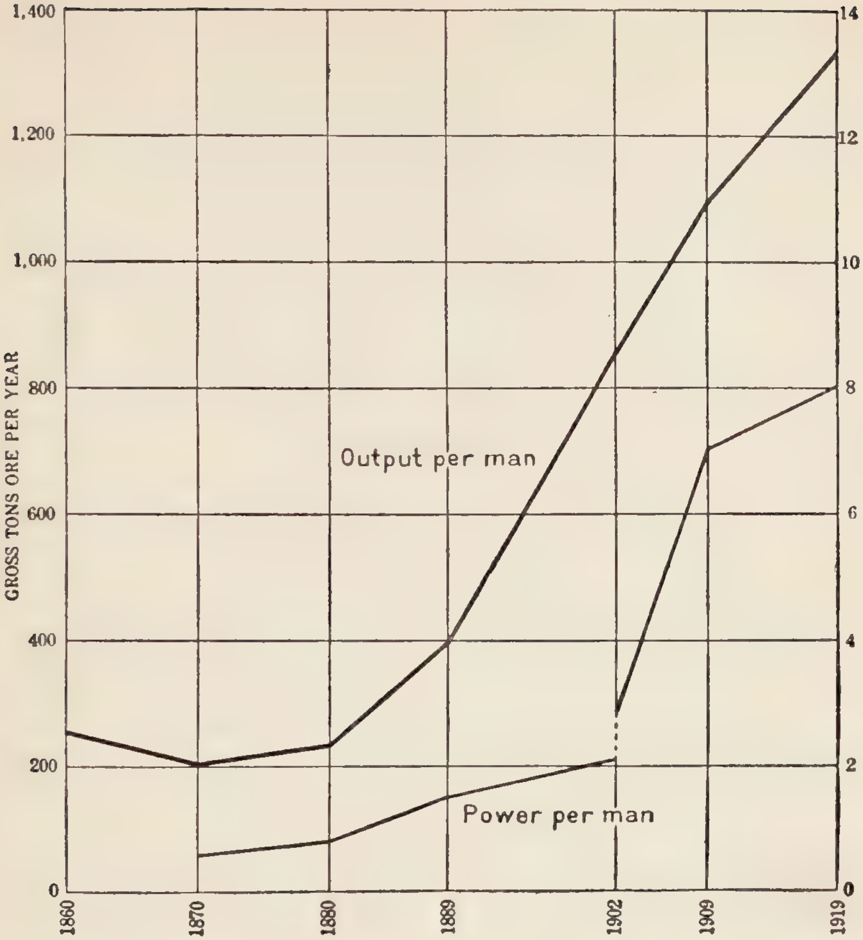

FIGURE 2. YEARLY OUTPUT OF IRON ORE PER WORKER EMPLOYED AT IRON MINES IN THE UNITED STATES

Figures represent tons of ore produced regardless of grade, as reported by the Census, divided by the average number of wage-earners employed. It is known that the average grade has been decreasing since 1893, but not by so great ratio as the increased output per man here shown. Curves for power represent total installed primary horsepower, divided by number of wage-earners. Prior to 1902, they include only steam power; after 1902, all primary power is included, and for 1902 both figures are shown.

resources; and the prospect of repeating the achievement in the next century turns largely on the possibility of commanding ever-increasing supplies of the same minerals. The very pressure of population upon the resources of farm and forest indicates an increasing drain upon the

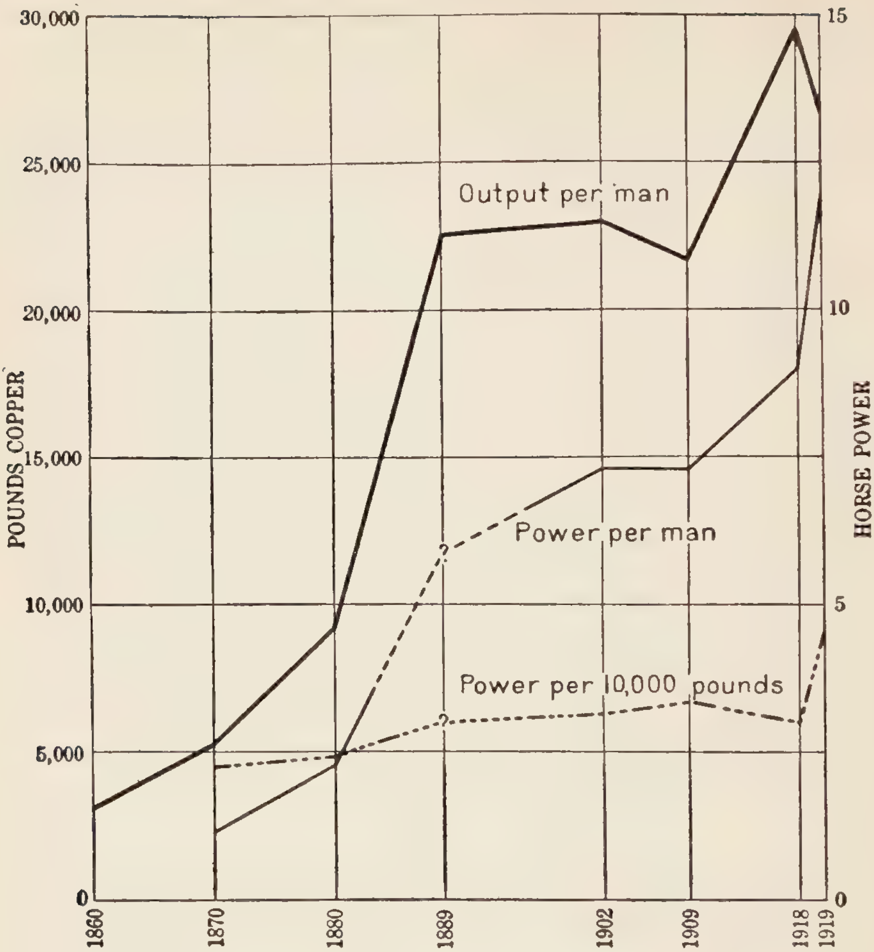

FIGURE 3. YEARLY OUTPUT OF COPPER PER WORKER EMPLOYED AT COPPER MINES IN THE UNITED STATES

Data represent pounds of metal in ore produced, divided by average number of wage-earners employed. Based on Census, except that for 1860, 1870, and 1918 (for which the Census gave no figures of metal produced), the reports of the Geological Survey have been used. The change between 1918 and 1919 is more apparent than real. It is largely explained by a sharp decrease in output and number employed, following the Armistice.

minerals. The farms will need more power and more fertilizer; and the decline in the supply of wood throws an increased burden on coal, not merely to replace firewood, but to make the brick to replace lumber. The recent forest conference at Washington stressed the need of preventing decay of wood by the greater use of *paint*.[1] On the same day, a geologist who has spent a lifetime in studying the metals remarked: 'I'm really concerned about *lead*. No good lead mine has been discovered for years, in spite of active prospecting. I believe it's high time to stop the use of lead in *paints*.'

It is uncertain how long the present annual consumption of the minerals could continue. It is certain that the present constant increase in consumption to which the civilized world has become accustomed cannot long continue.

Exhaustion and increased cost

Where, then, are future supplies to come from?

Concern over this question is a preoccupation of the geologist, for he is held responsible for locating future mines and can see more clearly than others the difficulties of finding them. If his studies indicate that the supply of oil from flowing wells will fail, it is his plain duty to say so, even at some risk to his professional reputation. In discharging this duty, he plays the rôle of Cassandra; and in impressing disagreeable truths upon a people who have known only an increasing supply of minerals, he perhaps overstates his case, underestimating, possibly, both the reserves underground and the powers of technology to recover them. The authors of this paper, though not geologists, have no doubt been influenced by this view.

To a geologist, the four or five thousand years during which the world's known coal reserves would last at the present rate of consumption seem a very short time, barely equal to the span of recorded history, only a small fraction of the time that beings much like ourselves have been tenants of this planet, and only a small part of the time we may reasonably hope to retain our lease upon it. But the economist thinks of four thousand years as a very long time; nor is he greatly impressed when told that, if allowance be made for even moderate increase in production, the life of the world's reserves is to be measured not in thousands but in hundreds of years.

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[1] *Wood Waste Prevention;* a digest of the problem before the National Conference on Utilization of Forest Products, 1924; p. 18.

A meeting-ground between these divergent views is found in the fact that absolute exhaustion is less to be expected than increased cost of recovery. Increasing cost is the ultimate fate of mining enterprise.

The principle of increasing cost in mining

It is a commonplace that the first reserves to be attacked are the outcrops of the richest deposits. As a mine deepens, the difficulties of timbering, ventilation, and haulage steadily increase. When it passes the groundwater level, the cost of pumping is added. Thus every mine suffers from a tendency to diminishing returns and increasing cost, except as offset by improvements in technique.

Tending to offset the factor of increasing cost are three other factors: technique, discovery, and transportation. The first, by the way, means chiefly applying another mineral in the form of power; the second and third, by opening up new and rich deposits, may avert the resort to lean ores and thin beds in the older districts.

Considering the world as a whole, the forces of technique, discovery, and transportation have thus far had clearly the best of it. The relative price of the metals declined notably during the nineteenth century. In the United States one unit of labor produces more copper, more iron, and more bituminous coal to-day than it did fifty years ago.

But considering individual mining camps or districts, or even some of the older countries, natural difficulties have had the best of it. As the world is prospected over and laced together by lines of transportation, the relief to be furnished by discovery and transportation becomes less, and the battle against increasing cost falls more and more exclusively upon technique. Technique acting alone has shown itself able to retard, but not permanently to reverse, the effect of increasing natural difficulties.

Now, clearly, a general increase in mining costs within the limits of a given market would mean decreasing abundance and rising prices of mineral supplies, would throw greater burdens upon other agencies of production — upon labor, capital, management, technology, and transportation — and would make advances in the standard of living correspondingly difficult. Very clearly, also, however remote the day of absolute exhaustion may seem, the day of rising costs in many branches of mining is not far away. The date of the turning-point will vary with each mineral or each market. In lead and petroleum mining, it seems imminent. In the coal mines of Belgium, the metal mines of Cornwall, and in our own anthracite mines, it has already arrived. It cannot be forecast for a particular mineral without careful study of the world's reserves of that mineral.

Something, however, may be said of the relative abundance of the several minerals and of the ways in which a growing scarcity of them would react upon our economic life. For our present purpose let us consider the minerals under two groups — the raw materials and the fuels.

Increasing costs of the mineral raw materials

Between the two groups there is a most significant relation. The fuels cannot be harnessed without the use of the raw materials, particularly the metals and the refractories. Thus the invention of the mercury-steam turbine has suddenly created a vast potential demand for mercury, a demand which in time may require a large part of the world's reserves of that metal. The raw materials, on the other hand, cannot be exploited without the use of fuels. In the United States, as shown by F. J. Katz, we now handle every year 500 million tons of ores and non-metallic materials, to say nothing of 100 million tons of oil and 600 million tons of coal. To move this vast tonnage is impossible without power; and we now consume over 200 million tons of fuel, equal to a third of our total output of coal, simply in mining, and in smelting and transporting the products of the mines. Hence any change in the production of the raw materials is immediately reflected in a change in the demand for fuels.

Of the raw materials, there are obviously some that, once produced, become a more or less permanent addition to the world's capital. Gold and platinum do not rust or decay, and most of the output is saved. Much of the copper absorbed by the electrical industry is a permanent asset. A surprisingly large part of the copper used by other industries reappears as scrap, and still less would be permanently lost if the price should rise.

There are other raw materials the supply of which seems truly inexhaustible. Into this group fall the crude materials of construction — stone, clay for brick, cement rock, limestone, glass sand, and the like. These cannot, however, be utilized, without heavy drafts upon the fuels; and, as we shall see, it is the fuels that promise to become the limiting factor.

The other raw materials furnished by mining we commonly think of as exhaustible. Our supply of them may be augmented by the development of new methods of locating concealed deposits, such as electric prospecting, or use of the torsion balance and seismograph. Moreover, if sufficient labor and power be applied, there is hardly one of them which either cannot be had from deposits below present commercial grade or for which a substitute cannot be found. Iron, which is seemingly indispensable, is widely scattered through the earth's crust. Copper, though rare, can be replaced by aluminum, which as a chemical element in rocks is even more abundant than iron. Both can be had for a price, but the price is a great increase in labor and power per unit of metal. The utilization of low-grade ores implies a tremendously increased drain upon our supplies of coal, oil, and water power.

The critical resources are, therefore, the energy resources. Upon them rests the burden of making good the scarcity of other minerals. Their indispensable rôle is illustrated by the change in the outlook for fertilizer materials. The three great plant foods are nitrogen, potassium, and phosphorus. Sir William Crookes once predicted that the exhaustion of the nitrate beds of Chile would leave the world without cheap nitrogen.[1] The shortage he expected has been met by increased use of power and heat, through the fixation of atmospheric nitrogen.

At the moment, potash has become the least abundant of the constituents of fertilizers. The primary reserves of potash are the mines of Stassfurt, Alsace, and Catalonia, and the more recently discovered deposits of the United States. But when these are no longer sufficient we can, by the use of power enough, get potash out of the silicate rocks, whence it originally came. Such a change, from material of 22 per cent grade to material of 10 or 2.5 per cent grade, would not decrease our dependence on potash, but would greatly increase our dependence on coal.

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[1] Charles R. Van Hise, *Conservation of Natural Resources in the United States*, p. 318.

The third of the plant foods, phosphorus, is at the moment in abundant supply, thanks to our reserves of rock phosphate; but the exhaustion of those reserves will throw an added burden on the energy resources, either to win phosphorus from leaner deposits, or to prevent its dissipation by returning sewage to the land.

Examples could be multiplied to show how the point of rising costs in the production of any of the mineral raw materials tends to increase the drain upon the energy resources. Whether the increased energy be spent in bringing in other ores from greater distances, as we may one day bring in the iron ores of Brazil, or in treating 20 per cent ore in place of 50 per cent, matters little; either way, our dependence upon coal, oil, and water power is increased.

The burden on the energy resources will also be increased by the exhaustion of our virgin timber. This country still burns the equivalent of 60 million tons of coal in firewood, much of which must eventually be replaced by coal. Supplanting wood in building will cost dear in terms of energy, for the manufacture of brick and cement consumes great quantities of fuel.

To sum up, our success in meeting the rising cost of mining the raw materials will turn on our ability to command greatly increased amounts of energy. Granted a boundless supply of power and heat, we can win the necessary metals from the earth. This does not mean that no increase in price is to be expected. Indeed, we may look for a sharp advance in the price of some of the metals before there is any marked change in the cost of energy. The reserves of the high-grade ores that can be worked at present prices are being exhausted faster than the reserves of coal that can be worked at present prices. The point is that we can be reasonably sure of obtaining the metal if we are prepared to pay the price. The limiting factor is, therefore, the supply of energy, to a consideration of which the argument now turns.

Increasing cost of the mineral fuels

At this point it is well to get clearly in mind the fact that the present supply of energy in the United States is derived chiefly from fuel, the contribution from water power and other sources being relatively small. The several sources of power and heat in 1923 yielded energy as follows: [1]

	British Thermal Units (in trillions)	Per cent of Total
Coal	17,300	65
Domestic oil	4,400	16
Natural gas	1,080	4
Imported oil	490	2
Water power [1]	1,140	4
Work animals [1] [2]	850	3
Firewood [1] [2]	1,500	6
Windmills [1]	20	0.1
Total	26,780	100

[1] Represented by heat value of coal necessary to produce same result.
[2] Figures necessarily only approximate.

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[1] Computed by the writers. The production of the several fuels has been multiplied by the following heat values in British thermal units: anthracite, 13,600 B.t.u. per pound; bituminous coal (with due allowance for lignite), 13,100 B.t.u. per pound; oil, 6,000,000 B.t.u. per barrel; and natural gas, 1000 B.t.u. per cubic foot.

Water power is represented by its coal equivalent, assuming that the thermal equivalent of one horse power hour is 7 per cent of the B.t.u. that would have been consumed in generating 1 h.p. hour from fuels in practice. The output of electricity in h.p. hours from hydro-electric utility plants is known and the output from the private plants has been estimated from the known installed capacity of their water wheels. Work animals and windmills are represented by the coal necessary to develop an equivalent number of h.p. hours, assuming 6 pounds of coal per h.p. hour (a very low efficiency). It is assumed that each horse develops 450 h.p. hours during the year. For the number of h.p. hours developed by wind, the estimate of C. D. Kinsman, of the United States Department of Agriculture, is taken. Firewood is represented by the coal equivalent of the consumption of fuel wood as estimated by the Forest Service.

These figures may excite surprise. It must be remembered that they include heat energy as well as mechanical energy; for power and heat are but twin forms of the same thing, and one can be converted into the other. The estimates for work animals and firewood are the roughest of approximations, but they represent correctly the order of magnitude.

Eighty-seven per cent of our energy is supplied by the mineral fuels. Although the United States has a third of the developed water power of the world, we derive from water but 4 or 5 per cent of our total supply of energy. We get less than one tenth of one per cent of it from the wind. The forest still yields us in firewood more energy than do wind and water combined. Forest, wind, water, and work animals all together furnish less than a sixth as much as the minerals.

Moreover, our dependence on the mineral fuels becomes every year more nearly complete. Prior to 1850 they furnished less energy than even the work animals. As late as 1880 the minerals were subordinate to firewood. In 1890 they contributed 60 per cent of the supply. In 1923, as just stated, their contribution was 87 per cent of the total energy supply.

These data, when reduced to a per-capita basis, give a measure of the rate of increase in the consumption of potential energy. Roughly it has doubled in thirty years. This increase is one of the most significant facts in our economic life and largely explains the increase in per-capita production of goods revealed by the indexes of the physical volume of production.

But these figures represent the potential energy in the fuel, not the energy actually developed. In the meantime, great progress has been made in the efficiency of utilization, so that the growth in energy actually developed has been even greater.

It is also to be noted that in this period (1880–1923) the energy resources were not being called on to make up deficiencies in the supply of mineral raw materials. The cost of mining copper and iron was falling, as measured by pounds of metal produced per unit of labor. It is true that more power was being applied to mining, but this was due to the universal tendency to substitute power for labor, rather than to any great increase in the difficulty of mining. The rate of increase in the consumption of energy was determined by influences outside the mining industry. Whatever burden future increases in the cost of mining the metals may throw upon the fuels will tend to be a net addition to the rate of growth shown by these figures.

Changes in the cost of energy

Any change in the cost of energy would thus have far-reaching consequences. A decrease tends to accelerate the substitution of machinery for hand labor; an increase has the opposite effect. It is, therefore, pertinent to inquire what effect the principle of increasing cost in mining may have upon the price of heat and power.

Now, of course, the cost of mining is not the only element in the price of energy. The price that actually determines the substitution of mechanical for hand methods is the price of the delivered energy, the rate per kilowatt hour or per million British thermal units of effective heat. Into this price enter also the cost of merchandising and transportation, and the cost of converting the fuel into useful heat or power and distributing it to the point of application.

The combined effectiveness of the several elements has been so far improved since the Industrial Revolution began as to bring about a notable reduction in the delivered price of energy.[1] Early in the nineteenth century steam transportation caused the price of coal delivered in London to drop many points in relation to the general price-level. The efficiency of the engines using the fuel has also greatly improved. Coal power was first applied on a large scale to pumping the English mines, which had generally been sunk to ground-water level in the eighteenth century. The fuel consumed for this purpose dropped from an average of about 15 pounds of coal per million foot pounds of duty in 1769 to 2 pounds in the Cornish mines of 1859;[2] and in the last fifty years the fuel required to transport a hundred tons of cargo one mile at sea has dropped from 20 pounds to 3.[3] Fuel efficiency has made particularly rapid strides since the World War. From 1919 to 1923 the coal consumption of the electric utilities per kilowatt hour declined 25 per cent,[4] and further great reductions are already assured. In fact, the price of electricity has advanced but little over the pre-War level; while in relation to the general price-level it has dropped many points since 1913.[5]

Clearly, this progress in fuel economy will continue to reduce the cost of delivered power, but for how long the writers of this paper hazard no opinion. It is worth remembering, however, that every advance brings us nearer to the limit of theoretically perfect efficiency, beyond which we cannot go; and though general practice in converting fuels into mechanical power is still very far below theoretical efficiency, our practice in converting fuel into useful heat and of converting water power into either heat or mechanical power is now fairly close to it. One may doubt whether the electric utilities, for example, would care to bond themselves to reduce the cost of power another thirty points below the general price-level in the next ten years.

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[1] W. Stanley Jevons, *The Coal Question* (second edition); pp. 78, 106, 107.

[2] *Ibid.*, p. 128.

[3] Hector C. Bywater, 'Steam and the Measurement of Power for Sea Transport,' *Transactions of the First World Power Conference*, vol. IV; p. 1138.

[4] *Annual Production of Electric Power and Consumption of Fuels by Public Utility Power Plants in the United States*, United States Geological Survey, June 10, 1924 (mimeographed).

[5] 'United States Bureau of Labor Statistics,' *Monthly Labor Review*, November, 1924; p. 867.

Even the price of delivered energy is, therefore, controlled fundamentally by the price of fuel, and it is likely to be so controlled still more closely in the future.

The price of fuel, in turn, is controlled primarily by the cost of mining coal. Firewood, as we have seen, is a small element in the supply of fuel, the price of which cannot rise much above the competitive price of coal.

Petroleum

The price of fuel oil over long periods is also controlled by the price of coal. At the moment, overproduction of crude petroleum, caused by the simultaneous discovery of five very large new pools, has forced the price of fuel oil down to a level that many coal producers cannot meet; but this is clearly a temporary condition. Oil and gas furnish outstanding examples of the principle that the richest deposits are worked first. They represent the cream of our energy resources. The current production would exhaust our estimated reserves of oil that can be recovered by present methods in from ten to twenty years. Deeper drilling and increased efficiency in extraction may be expected to postpone, but not to avert, the day of declining output. The oil companies are already considering the steps to be taken when sufficient oil cannot be obtained from our own wells. Imports of crude oil, mining and treating the oil sands, distillation of oil shale, recovery of the oily by-products of coal, all promise results, but at increased costs in labor and power. The day of increasing costs in this our most convenient source of energy is imminent. David White goes so far as to predict a world shortage of petroleum in twenty years.[1] Not the least important result will be to throw increased burdens upon coal.

Increasing costs in coal mining

The cost of coal mining, then, is the critical element in determining the supply and the price of energy. Rising costs of mining coal must sooner or later be reflected in higher prices of energy. Few indexes of a nation's economic life deserve closer attention than the trend of coal-mining costs.

A measure of coal-mining costs. A good measure of the cost of coal mining is the quantity produced per miner. Moreover, it expresses pretty accurately the pressure of population upon the sources of energy. In the bituminous mines of the United States the labor of each man underground for one day produces about 5 tons of coal. In Australia a day's labor produces about 4 tons; in England, Germany, and France, not much over 1 ton; and in Belgium and Japan, only 0.8 ton. The figures are:

COUNTRY	YEAR	NET TONS PER MAN UNDERGROUND PER DAY[1]
United States, bituminous	1923	5.15
United States, anthracite	1923	2.79
New South Wales	1918	4.07
Great Britain	1913	1.28
Prussia (Steinkohl)	1913	1.32
Austria (Steinkohl)	1912	1.21
France	1913	1.08
Belgium	1913	.80
Japan	1913	.83

[1] Data for foreign countries from W. W. Adams, 'A Miner's Yearly and Daily Output of Coal,' United States Bureau of Mines, *Reports of Investigations*, July, 1920. Serial No. 2145. For countries in which the War reduced production, the figures are for 1913; otherwise, the latest available.

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[1] David White, 'The Petroleum Resources of the World,' *Annals of the American Academy of Political and Social Science*, May, 1920; p. 20.

A day's labor in the bituminous mines of the United States will capture just about four times as much energy as in the mines of Britain and Germany, and about six times as much as in the mines of Japan; not because American labor is so much more industrious and intelligent, but rather, because it is working in thick seams which lie near the surface. Also, to be sure, because it is backed by more machines and more power; but the very fact that it pays to use more power in American mines indicates that the pressure of population on the means of subsistence is less severe in America than in the other countries.

Now, if this index of coal output per worker *rises* or *falls*, the change indicates a change in the relative abundance of human labor on the one hand and of energy on the other. As long as the output per man rises, each unit of human labor is capturing more and more energy. When it begins to fall, more and more units of labor must be spent to produce the same amount of energy. Energy costs have then started on the upgrade, except as they may be offset by economy in combustion.

Let us now apply this index to coal mining in some of the older countries, where increasing natural difficulty in mining has had time to make itself felt.

England. Applied to England, the index shows that the predictions made by Jevons in 1865 are slowly being verified. The output per man per year in Great Britain can be computed for each year since 1854.[1] From the fifties to the eighties it steadily rose. It reached its highest point in 1883, and since then it has shown a slight but perceptible decline. The universal adoption of the eight-hour day in 1908 and of the seven-hour day in 1919 brought further reductions in output both per year and per day. To a large extent the shorter day is a net advance in the standards of the British miners, but to a certain extent it is a recognition of the increasing difficulties of their occupation. Now this decline, though slight, really represents a great increase in the natural difficulties of mining, because during the same time the output per worker in most other arts was increasing through steady improvements in technique. We know that technique was also busy in the mines, for during this same period it accomplished an amazing reduction in the accident rate. In 1851 the deaths from accidents in Great Britain were 5.5 per thousand men underground. Fifty years later they had dropped to 1.5.[1] But the savings of technique applied to the task of mining itself were not quite sufficient to offset the increase in the depth and age of the workings and the gradual exhaustion of the thick coal. The result has been a slow increase in the cost of coal, registered not merely in units of labor per ton of product, but in the pit-mouth price in comparison with other commodities. This increase, at a time when the pit-mouth prices of coal in the United States were falling, has reacted unfavorably upon English industries. It has tended to increase all costs that involve heating, such as the manufacture of iron, though up to the present its effect on the cost of power has been offset by the use of more efficient engines.

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[1] United States Commissioner of Labor, 'Coal Mine Labor in Europe,' *Twelfth Special Report*, 1905; pp. 416–17. Also, W. W. Adams, 'A Miner's Yearly and Daily Output of Coal,' United States Bureau of Mines, *Reports of Investigations*, July, 1920.

European Continent. Continental mines also show a period of steady increase in output per man up to the eighties or nineties, followed by a period of stationary output in which technical advances are negatived by increasingly difficult natural conditions.[1] In Belgium the output per man appears to be distinctly on the downgrade. The average thickness of the seams mined in Belgium is now 28 inches.[2] The average thickness in the bituminous mines of the United States is about 64 inches.[3]

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[1] United States Commissioner of Labor, *op. cit.*, p. 444. Also, *Coal Mine Accidents in the United States and Foreign Countries*, United States Bureau of Mines, Bulletin 69, pp. 64, 87.

Some new departure in mining technique may for a time reverse the downward trend of the output per worker. Aside from such a possibility, the evidence shows that Europe is approaching the critical point of increasing costs of energy, if indeed she has not passed it.

United States. In America coal mining exhibits both increasing and declining costs. Our anthracite industry affords a perfect example of rising costs. Mining was begun on a commercial scale about a hundred years ago, and, if the present rate of output is continued, can last for about a hundred years longer. The workings have become progressively deeper, and, as the thick and nearly level beds are gradually exhausted, the output comes increasingly from the thinner and steeper dipping measures.[4] To meet the increasing difficulties, more and more power has been required. In 1885 the collieries consumed 6 per cent of their output for mine fuel. In 1920 they consumed 11 per cent. The record of output per man per day in anthracite mining is difficult to interpret, because it involves culm-bank washery coal. Since 1911, when this coal can be eliminated from the figures, the output per man-day has been stationary.[5]

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[1] United States Commissioner of Labor, *op. cit.*, pp. 34–37, 134, 198, 308–09. Also, W. W. Adams, *op. cit.*

[2] Belgium, Ministère de l'Industrie et du Travail, *Statistique des Industries Extractives et Metallurgiques*, 1922; p. 794.

[3] C. E. Lesher, *Coal in 1917*, Part A, 'Production,' United States Geological Survey; p. 934.

[4] D. C. Ashmead, series of eight articles on the increasing difficulty of mining anthracite, published in *Coal Age*, 1923, vol. 23; pp. 323–29, 475–80, 551–58, 749–54, 885–90, 999–1004; and vol. 24; pp. 347–50.

[5] F. G. Tryon and Sydney A. Hale, *op. cit.*, p. 507.

In the meantime, the cost of timber and supplies has increased. The cost per ton, as reported to the United States Coal Commission, rose, from $2.30 in 1913 to $5.62 in the first quarter of 1923, or at a greater rate than the increase in the wage scale.[1]

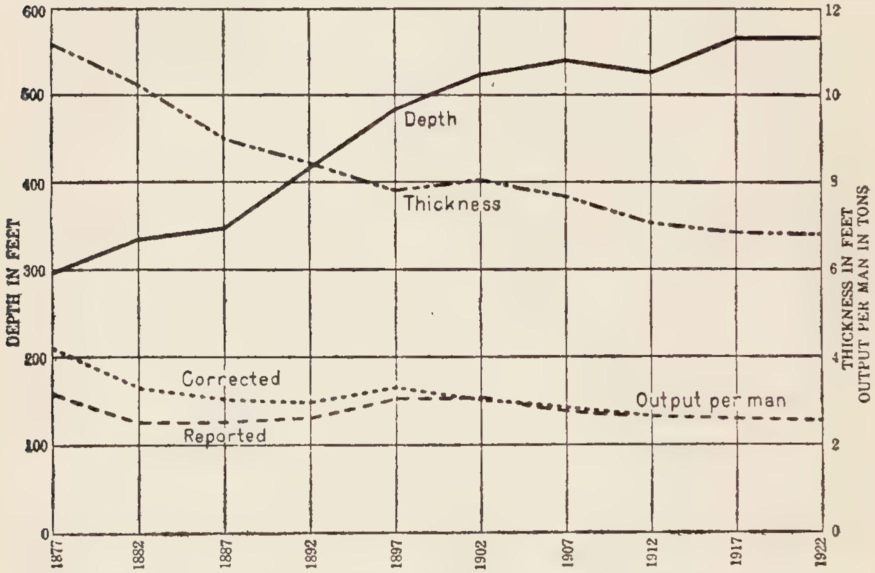

FIGURE 4. INCREASE IN DIFFICULTY OF MINING ANTHRACITE IN THE UNITED STATES, AS ILLUSTRATED BY THE NANTICOKE DISTRICT

In 45 years the average thickness of seam worked has declined from 11.19 to 6.83 feet and the average depth of the workings has increased from 296 to 567 feet. The output per employee underground, per day, has therefore tended to decline. In 1922, it was 2.58 gross tons. In 1877, it was 3.15 tons, a figure which should be corrected to 4.20 tons to make it comparable with that of 1922. The correction is necessary because of the change in the length of the working day and the practice of recovering the small sizes of coal which have since occurred.

From studies of D. C. Ashmead, *Coal Age*, April 5, 1923; p. 551.

For the American bituminous industry, the exhibit is just the reverse. Since 1840, when the first record begins, there has been a steady increase in productivity per unit of labor. Between 1840 and 1889 the output per man per

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[1] David L. Wing and James E. Black, 'Cost of Production of Anthracite Coal,' *United States Coal Commission Report*, August 23, 1923 (mimeographed); Tables I and II; p. 18.

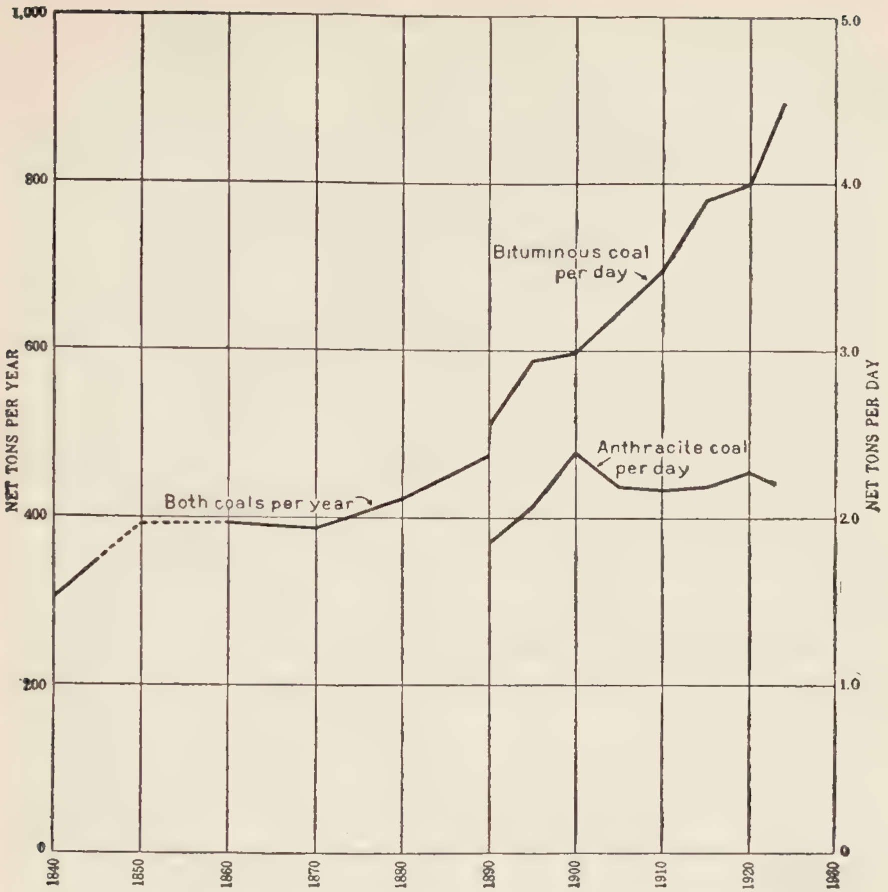

FIGURE 5. OUTPUT OF COAL PER MAN IN AMERICAN MINES

Output per man in American bituminous mines has largely increased since the beginning of mining and continues to increase. Before 1890, the only consistent record is the output per man per year, in both anthracite and bituminous mines. Beginning with 1890, the more accurate measure of output per person employed per day is available.

year rose from 304 to 476 tons.[1] In 1890, when the more accurate record of output per man per day begins, each day's labor produced 2.5 tons. In 1923 a day's labor produced 4.5 tons.[2] In other words, one unit of labor in 1923 could capture 75 per cent more of the raw stuff of energy than thirty-three years before.

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[1] Computed from the *United States Census Reports.* The figures include anthracite as well as bituminous coal, but in the period 1840–89 exhaustion of the anthracite mines had not proceeded far.

[2] F. G. Tryon and Sydney A. Hale, *op. cit.*, p. 506. These figures represent the output per man employed, including both surface and underground workers, and therefore differ from the table, which presents the average per man underground.

Moreover, in the immediate future this increase will continue. The introduction of loading machines, forecast in 1920 by Arthur J. Mason, has now begun.[1] The Geological Survey has records of over 750 thousand tons loaded by machines in 1923. The loader and the belt conveyer, and the changes in management that go with them, may be counted on to carry the output per man still higher.

But in the meantime the thick and more easily accessible beds of coal that have made these advances possible are being worked out much faster than is commonly supposed. As yet there has been no serious increase in natural difficulties to offset the advances of technique: it is doubtful if the average thickness of the beds mined has decreased at all in thirty years; it is doubtful, also, if the average depth of our mines is yet as great as that reached by the English mines in 1760.

Because the thick beds can be worked cheaply, mining is centered upon them. G. H. Ashley, Director of the Pennsylvania Survey, writes, 'For fifty years the Pittsburgh bed of Pennsylvania has produced about one fifth of all the soft coal mined in the United States and in 1913 it produced about 7 per cent of the world's total production. . . . Yet at the present rate of mining, a generation will see the end of the Pittsburgh coal in Pennsylvania.'[2] The expected life of the smokeless coals, which are the highest in quality and in value, is placed at about 150 years; but of these, also, Dr. Ashley reports that the output is coming from thick beds, which yield the cheap coal, and that these will be gone in from 60 to 90 years. Our reserves of bituminous coal seem enormous on paper. But even at the present rate of depletion, with no allowance for increase in demand, the thick and easily worked coals of the Appalachians will be gone in a few generations. Though the day of ultimate exhaustion is measured in hundreds or thousands of years, the day of increasing costs and failing supplies in our Eastern centers of production is measured in scores of years.

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[1] Arthur J. Mason, 'Comments of an Ore Engineer,' *American Economic Review*, Supplement, March, 1921; p. 107.

[2] G. H. Ashley, 'A Glance into the Future,' *Electrical World*, November 15 and 22, 1919; pp. 942–43.

Increasing cost of mining can be offset for a time by greater efficiency of use. But, as already pointed out, we have become accustomed to more fuel and more efficiency too. The 75-fold increase in the consumption of the fuels in the last century was made in spite of a great improvement in technique. But thermal efficiency has its limit. It can postpone, it cannot avert, the day of increasing costs of energy.

Substitute sources of energy

Nor do the substitute sources of energy promise to furnish power and heat on as easy terms as coal. The water power of the United States is sufficient to meet only a part of the burden already carried by coal. The tides and winds can no doubt be drawn upon; but so far as we now know, only at great cost, in which one unit of labor and capital yields fewer units of energy than now.

It may be possible to harness directly the energy of sunlight; yet, so far, no man-made engine can do this as cheaply as the living plant. But we need the plants for materials and food, and our whole corn crop would not make alcohol enough to replace gasoline.[1] The energy in an entire year's production of human foods in the United States is equal to only 3 per cent of that in our annual output of fuels.[1]

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[1] Boyd, 'Motor Fuel from Vegetation,' *Journal of Industrial and Engineering Chemistry*, vol. 13, 1922; p. 836. See, also, H. A. Spoehr, *Photosynthesis and the Possible Use of Solar Energy*, Smithsonian Institution, Publication 2729.

There remains the possibility of utilizing the energy locked up in the atom. This problem — the solution of which is perhaps unattainable — is one of the most alluring. On this subject, Ernest Rutherford, in his presidential address before the British Association in 1923, sounded a note of caution.[2] 'There is not the same certainty today as a decade ago,' he writes, 'that the atoms of an element contain hidden stores of energy. . . . It may be that the presence of a store of energy ready for release is not a property of all atoms, but only of a special class, like the radioactive atoms.' And he adds, of the radioactive elements, uranium and thorium, 'Unfortunately, . . . there is no evidence that the rate of disintegration of these elements can be altered in the slightest degree by the most powerful laboratory agencies.' To count upon atomic energy to support our future population is an act of faith. The realities of the world as we now know it leave us dependent on coal.

Conclusion

The conclusion of the argument cannot easily be stated without a tone of conviction that the fallibility of human insight does not warrant. Were the authors of this paper gifted with prophetic vision, they might attempt to picture a day of wrath when all the coal shall be gone. Even then, perhaps, we need not fear the shipwreck of what Carlyle calls 'this little life boat of an earth with its noisy crew of mankind.' The glory of Greece did not rest upon coal, and there are many things worse than a reduction in the standard of living. A permanent civilization must learn to balance its energy budget, to collect each year from the inexhaustible sources of water, wind, and sun as much power as it expends. A rational view of our stores of the mineral fuels would regard them as a bonus to be used in acquiring the skill and in building the engineering works needed to harness the inexhaustible sources of power. Whether such a balanced energy budget can yield a revenue equal to our present expenditure depends on future discoveries of science.

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[1] Raymond Pearl, *The Nation's Food*, p. 76.

[2] Sir Ernest Rutherford, 'The Electrical Structure of Matter,' *Nature*, Supplement, September 15, 1923; p. 417.

But if absolute exhaustion belongs to the realm of prophecy, rising costs of mining may be expected in the not incalculable future, and ought to be considered in a discussion of whether the growth of population should be fostered or discouraged. Though our apprehension of the pinch may prove needless and our judgment of when it will be felt be erroneous, the purpose of this book demands a statement of whither the evidence leads.

As far as the minerals are concerned, the evidence forecasts in the not distant future a period of diminishing abundance and rising costs, in which — barring some revolutionary discovery of science that will free men from dependence on fuel and water power — it will be harder to maintain even our present population at present standards of living. During the immediate future, our population may continue to increase and our standard of living may continue to rise, merely because our mines are still easy to work; but further increase of population will simply hasten the day of rising cost of energy and will make readjustment to the changed conditions increasingly difficult.

This conclusion contains less of pessimism than of prudence. It may, indeed, be attacked on the ground that it underrates the power of science and of technology. But if science shall make a revolutionary discovery, if man shall unlock the secrets of photosynthesis and atomic energy, our population may then be trusted to increase to the point at which it can make full use of the new stores of power.

PART IV

POPULATION AND IMMIGRATION

CHAPTER IX

RACIAL COMPOSITION OF THE POPULATION

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The relation between the title and the content of this chapter may suggest the famous essay on *The Snakes in Ireland.* Not that there is no racial composition of the American people — far from it. But it is certain that we shall never know what it is. Many facts about our National make-up have yielded to the patient delving of the historian, and many more will doubtless be uncovered in the future; but no amount of research can ever reveal conclusively the exact racial elements that compose our body politic, using 'racial' in its correct and limited sense.

The noun 'race' and the adjective 'racial' have an exclusively biological connotation, when accurately used. Unfortunately, accuracy in this connection is conspicuous by its absence, not only in the casual allusions of the layman and the non-technical writer, but also in the discussions of supposedly scientific specialists. One of the first steps in the establishment of constructive measures in connection with immigration and other aspects of the great population problem is the recognition by social scientists and practical politicians of the real meaning and significance of 'race.' Particularly important is it to discriminate clearly between 'race' and that entirely different principle of group unity for which there is no better word than 'nationality.'

A race is a variety of the human species, a subgroup bound together by ties of physical kinship. Persons who are members of the same race have a closer family relationship to each other than they do to members of other races. In other words, the ancestral lines of the members of a single race draw together sooner than do those of separate races. If we go back far enough, of course, the ancestral lines of all human beings coalesce into one common trunk. Racial differentiation, accordingly, is purely a relative matter.

There is great difference of opinion and practice, not only among laymen, but also among ethnologists and anthropologists, as to just the point of cleavage between human groups at which the race line shall be drawn; that is, as to just the degree of particularization necessary to constitute a group a race. Thus we speak not only of the great primary divisions of the human species — the white, brown, black, yellow, and red, to take a common classification — as races, but also of the subdivisions of these primary groups, as when we divide the white race into the Nordic, Alpine, and Mediterranean. We may even go further and apply the term 'race' to the subdivisions of one of these groups, as the Libyan, Iberian, Ligurian, and Pelasgian sections of the Mediterranean race. The confusion arising from this kind of indefiniteness is much less serious than that occasioned by the practice of using the term 'race' to apply to human groupings, and the term 'racial' to designate group traits that are not biological at all. The habit of using as racial identifications the names of countries or states is peculiarly pernicious. To speak of the English race, the French race, the Italian race, or the American race — God save the mark! — is an abomination.

Race, then, is a matter of a definite stream of germ plasm. Racial groupings are determined by the degree of community in the germ plasm of the individuals who compose them. Racial traits are those distinctive characteristics which are passed on from generation to generation through the medium of the genes carried in particularized streams of germ plasm.

There are, consequently, two ways and only two of determining to what race an individual belongs. The first is by tracing every particle of his germ plasm back to its source. This would mean reconstructing his entire family tree and is manifestly impossible. For practical purposes, it is usually sufficient to trace the ancestry back for three or four generations. Then, if no racial complications are met, it is reasonable to assume that the race of the individual in question has been established. For practical purposes, also, it is helpful to take into consideration environmental factors, as indicating the probability, or the reverse, of racial admixture having taken place. Thus, for example, if the individual and his immediate ancestors have lived all their lives in some remote and inaccessible region of Central Asia, the presumption of racial simplicity is much greater than if their home has been in Singapore or New York.

The second way to determine the race of an individual is to examine the outward features which are the visible expression of the characteristic determiners which he carries in his germ plasm. This is the more feasible, and the commonly accepted method. It is accurate in so far as the race criteria are observable, and are positively indicative. In practice, it is doubtful if this method can go much further with complete reliability than to indicate the *predominant* racial affiliation of the individual. Minor racial elements, a thirty-second, a sixteenth, or even an eighth, can hardly be relied upon to express themselves in the body plasm in a definitely identifiable form. The upshot of the matter is that it is seldom possible in the case of an individual to be positive of more than the racial preponderance in his make-up; and this is true as well of most existing human groups, though in the case of groups the historical factors which throw light are often more ascertainable than are the genealogical factors in the case of an individual.

Turning to the problem of a group like the population of the United States, which (except for the aboriginal element, which can be left out of the account) has been built up within a recent historical period, it is clear that the present racial constitution has been determined by two sets of factors. The first is the actual contributions from outside sources — the people who have come from existing groups, bringing their own germ plasm with them. These may be regarded as the seeds of the new population. The second set of factors includes the vital phenomena of the different elements planted in the new country — their birth-rates and death-rates and resulting rates of growth of population. Obviously, also, emigrations have their proportional effect and should be taken into the reckoning.

If all the plasmic elements introduced into the new population from first to last are identical — that is, if all the migrants from foreign sources are of a single pure race — there will be no question about the racial composition of the resulting group. It can only be the same as the seeds from which it has grown. And on this supposition it clearly makes no difference at what period in the growth of the new population a foreign migrant comes. One of the original hundred settlers of the region has no influence on the racial make-up different from that of the most recent arrival.

But if the seeds planted at different times represent different streams of racial germ plasm — as has probably been invariably the case within the historical period, and emphatically so with the United States — then it makes a profound difference at what time a given individual arrives, for then the second set of factors, those connected with multiplication, come into play. This is why the racial composition of the American people at the beginning of its independent National life, and the streams of migration during the Colonial period, are of such vital significance, not merely from the academic point of view of historical accuracy, but still more from the point of view of the practical meaning of racial factors in our contemporary life.

It is clear, then, that, in order to form reliable conclusions as to the present racial composition of our people, we should have at hand accurate data covering the racial affiliations of all migrants from the beginning of the seventeenth century down to the present, and the birth- and death-rates of each separate racial element in this country. It is also clear that the farther back in time we go, the more important do these data become; errors are cumulative. For such data we should turn naturally to three sources — the statistics of immigration, the Federal vital statistics, and the Census Reports.

The complete hopelessness of the problem now becomes distressingly clear. The Federal immigration statistics go back only to 1820, and previous to that time there are no even approximately complete or authoritative figures. The birth and death statistics are of much more recent origin, and even at the present time include only about three fourths of the total population. The Census Reports date from 1790, with some earlier Colonial censuses which have been admirably digested in the well-known volume, *A Century of Population Growth*. Worst of all, however, is the fact that none of these sets of statistics gives any general facts about race, with the exception of the Immigration Reports, and these only for the past twenty-five years. The Census Reports and the Reports of Vital Statistics make some broad distinctions on the basis of color, but when it is recalled that for Census purposes any proportion of black blood whatever constitutes a person a Negro, it is clear that the Census figures are of no value in determining the exact proportions of racial stocks. If a thousand white persons and a thousand pure-blooded Negroes unite to form a community, the racial proportions will be fifty-fifty, whether the races remain separate or whether they mix. In fact, as soon as the racial elements in a population become mixed, it becomes practically impossible to classify vital statistics on racial grounds. The classification on the basis of mother tongue, followed in the last two Censuses, is in no sense racial.

Unless some tests, far more minute and conclusive than any yet devised, are discovered for determining the racial constitution of an individual from the observable characteristics of his body plasm, there seems to be not the slightest chance of ever getting more than the most general idea of the racial composition of our people. Even if such tests could be devised, it is not likely that they would ever be universally applied so as to furnish conclusive results.

It seems probable that, for many years to come, at least, the nearest we shall be able to come to the racial composition of the American people will be an analysis of the geographical origin of our various population elements. Geographical origin is significant of race only to the extent that geographical populations are racially homogeneous and constant. Place-names as a rule mean nothing. This may be illustrated by the principal

European streams which flowed into the American Colonies — then and now known as English, German, Scotch-Irish, Dutch, French, and so forth. None of these is a racial designation, correctly speaking. The English population is composed of early Mediterranean, Alpine, and various types of Nordic, mingled in varied proportions in different parts of the island. The Scotch-Irish, in the words of John R. Commons, are 'very little Scotch and much less Irish' — neither of these being racial terms. In point of fact the Scotch-Irish are a much-mixed group. The Germans were almost certainly mainly Nordic, but probably not entirely; and so on.

Several interesting and important attempts have been made to distribute the American population at different periods according to country of origin. Probably the most authoritative of these is *A Century of Population Growth*, which apportions the population at the time of the first Census, in 1790. This reckoning was based on surnames, and has been criticized on the ground that this evidence is inconclusive. It has been urged that given names also should have been considered. Granting this, it still remains true that the estimates furnished are probably a close approximation to the facts. The evidence of names at a time when they were much less standardized and formulized than at present is of great weight, particularly in the case of such names as were taken directly from common nouns in everyday use in different languages. *A Century of Population Growth* contains a long list of representative surnames which almost infallibly mark the bearer as English.

This method of inquiry indicates that the population of 1790 was distributed as follows: English, 82.1 per cent; Scotch, 7.0 per cent; Irish, 1.9 per cent; Dutch, 2.5 per cent; French, 0.6 per cent; German, 5.6 per cent; all other, 0.3 per cent.

For a later date we have the painstaking estimate of Clinton S. Burr, which apportions the various stocks of the population of 1920 according to country of origin as follows:[1]

Northwestern European	80,984,319
Eastern European	4,978,178
Southern European	3,993,894
Semite, etc.	3,391,498

Mr. Burr goes a step farther, and attempts to represent the same facts in true racial terms by calling the Northwestern European element Nordic, the Eastern European element Alpine, the Southern European element Mediterranean, and the Semite element Assyroid.[2]

A. J. Lotka, of the Metropolitan Life Insurance Company, after a careful survey of the all too meager existing data, has arrived at the conclusion that, as nearly as can be estimated, about 47 per cent of the white population of 1920 was composed of descendants of the population of 1790, presumably distributed among the different foreign origins in about the same proportions as was the population of 1790. The remaining 53 per cent was composed of immigrants since 1790 and their descendants. It would be exceedingly interesting and important to distribute this newer portion of our population on the basis of foreign origin; but such a distribution would, unfortunately, require extensive, non-existent data with reference to the marriage-rates, birth-rates, death-rates, and emigration of the foreign-born stocks and their descendants.

There is one practical consideration with respect to which country of origin has a real racial significance.

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[1] Clinton S. Burr, *America's Race Heritage*, p. 130. Details given in the table.

[2] *Ibid.*, p. 141.

This is the question of preserving unchanged whatever racial composition our population may have at the present time. As observed above, as long as the contributions from foreign sources continue to come from the same countries, and as long as the racial stocks of those countries remain relatively constant, there will be no notable change in the racial composition of the new population, at whatever time the migrants come. There can be little doubt that the population at the time of the Revolution was composed almost entirely of migrants from the northwestern countries of Europe and their descendants. The original United States population must have been a close replica of the aggregate population of this region, a relatively homogeneous composite, predominantly Nordic. There is also no doubt that for the next one hundred years the great majority of the immigrants were recruited from the same general sources, the chief variation being found in the heavy Irish immigration, the result of which was to increase the proportion of primitive Mediterranean stock, which, however, was already largely represented. The basic population of the British Isles is primitive Mediterranean, Ireland having probably experienced less admixture than the other portions. Thus, although we cannot tell exactly what the racial composition of our population was, up to about 1882, we are certain that it was remaining virtually constant.

It is a matter of common knowledge that at about the year mentioned a sweeping and significant change began to take place. The sources of immigration shifted away from Northwestern Europe to Southern and Eastern Europe. This meant a vast increase in the proportions of Alpine and modern Mediterranean stocks, and the introduction of various new stocks, hitherto virtually unrepresented, such as the Semitic, Turki or Turanian, and

Magyar. As the volume of this immigration swelled decade after decade, there resulted a rapid alteration in the racial preponderance of the American people — which, as has been noted, is about all there is to the race type of any modern country — with potential consequences which no one could foretell. The long establishment of the Nordic elements gave them a position of advantage as long as the increase of the new strains depended chiefly upon immigration itself. But as the new stocks began to be incorporated into the body politic and to increase by reproduction as well as by immigration, the racial dilution proceeded at an accelerating rate, particularly on account of the high birth-rate of the foreign stocks. It took about a generation for the American people to awaken to the menace of the new situation and it took the World War to afford the final push that determined them to do something about it.

The result was the immigration law of 1924. Beginning with July 1, 1927, a flat total of 150,000 immigrants is to be distributed in accordance with the actual composition of the population of 1920. There can be little doubt that the framers and supporters of this law were actuated by a desire to check the racial dilution of the American people, and to guarantee, as far as it could be done through an immigration law, that the racial composition of the people of the United States should remain unchanged through future generations. But for reasons which should now be plain, the law could not be drafted in true racial terms. Instead of race, national origin was adopted as the basis of classification, and nationality was defined as country of birth. This, as has already been pointed out, is a fairly satisfactory, rule-of-thumb method for keeping the racial factors constant. The Departments of State, Commerce, and Labor, aided by the Bureau of the Census, are now working on this problem and should turn out an analysis far more nearly complete and authoritative than any single individual could hope to produce.

Possibly it may not be out of place, in closing, to raise the question whether it makes any practical difference to us as American citizens what the racial composition of our population is. Is there such a thing as racial superiority and inferiority, or was the Irishman correct who asserted that one race is just as good as another — and far better? Are mixed races as good as pure races, or better, or worse? There can be as yet no conclusive answer to these questions. Before the question of race superiority can be settled, there must be universally accepted criteria of racial value, by which particular races may be appraised. Nothing of that kind now exists.

With reference to the relative value of pure and mixed races, also, we lack conclusive evidence. On this point, however, it appears that certain assumptions are justified. These assumptions are taken from biological analogies and are supported by the fact that race is a biological matter. In other words, we feel certain that the basic principles of heredity which run through the entire realm of lower organisms must also hold for man. The facts of cross-breeding among plants and animals are well established. The most important of these, for the purpose in hand, is that the indiscriminate interbreeding of the varieties of a species produces a mongrel type. This is true even though each separate variety may be a highly developed type. So it seems wholly probable that the indiscriminate mixing of the races of men in a human population, even though the particular races are the finest on earth, is essentially a process of mongrelization.

The result will be a generalized, primitive type. There is much to be said for the mongrel, as every one knows who has ever loved a yellow dog. He is tough, he can stand a lot of punishment, and he is not so particular about his standard of living as the high-bred pup. But no one would maintain that the yellow dog represents the highest product of canine evolution.

As to the results of mixing human breeds, we must await further evidence before scientific conclusions can be made. Analogies are not proofs. But one thing is certain: the process of race mixture can never be reversed. Streams of germ plasm once mixed will stay mixed. It is no more possible to disentangle a mixed race than it is to unscramble the proverbial egg. Consequently, until we are positive about the values of race mixture, the wise policy is to avoid it. It will be easy enough to promote race mixture when and if we become scientifically convinced that it is what we want. Until then, the line of safety is indicated by the good old maxim — 'in case of doubt, don't.'

CHAPTER X

EFFECTS OF IMMIGRATION ON THE AMERICAN TYPE

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Has an American type of man already been developed, and if so, what is that type? What effect has the changed character and phenomenal increase in immigration since the middle of the last century had upon this development? In other words, what physical and mental potentialities did that immigrant stream bring us? Have we or have we not scientific grounds for fearing racial deterioration as a result of our former liberal immigration policy? To answer these questions presupposes a knowledge, on the one hand, of the physical make-up of the older Americans, and on the other, of the types of the different immigrant groups.

Up to recent years the belief in an American physical and behavioristic type has rested on a merely empirical and more or less superficial basis. Such a type has been represented in art and in literature, but its scientific determination has been wanting. It is a well-established fact, however, that people of any nationality, even though of heterogeneous origin, after centuries of existence as a linguistic and political group, tend to develop similar habits, similar bearing, similar behavior, and gradually even similar physical characteristics, especially similar physiognomy, and thus come to constitute a fairly readily recognizable *type.* How far this development has had time to progress in the United States was until recently a moot question. The general notion was that a type had developed far enough to be without much difficulty distinguishable from the peoples of other countries.

A critical inquiry into the subject disclosed little of data outside the Census statistics, and Army and Navy measurements (limited to stature and weight), with some records on American children. Under these conditions it was natural that at first the greatest use should be made of the Census data.

The Census records showed that the older American stock, or that dating from before 1820, consisted principally of English and Welsh people or their descendants, with strong infusions of Scotch and Scotch-Irish, Germans, Dutch, Irish, and French, in the order named. However, English and Welsh with their descendants constituted more than three fourths, and English, Welsh, Scotch, and Irish not far from nine tenths, of the early United States population. These figures are, of course, only approximate and differ somewhat according to various sources. But the main fact is well established; the population up to 1820 was essentially of British derivation; and the American type of that time, it is safe to conclude, must have closely resembled that of Great Britain.

A century has elapsed since then. The unmixed descendants of the families of 1820 are now at least of the third generation Americans. The old components of the stock, except those — and there are many — who have intermarried with more recent comers, have become considerably unified through admixture among themselves. Moreover, they have now been exposed to from one to three centuries of the American environment, which in many important respects differs from that of the old countries. This must have had some effect upon the behavior-habits and probably even upon the physical type of the old stock, leading it away from British standards toward something more and more American. This would seem to justify the assumption that this country may already have approached a separate behavioristic and physical type as far as the older native stock was concerned, and that it remained for anthropology to determine how far this had proceeded and just what the type was.

Anthropologists had recognized this problem long before the War and many years in advance of the mischievous, pseudo-scientific literature which during the last decade has flooded this country and spread alarmistic untruths, bias, and intolerance. This led me to undertake a detailed physical and partial physiological study of the living representatives of the Old Americans. The work was done partly in my laboratory in the United States National Museum, partly outside; and the collection and elaboration of the data, begun in 1910, has lasted nearly fourteen years. The whole has proved an arduous undertaking, since, unless one goes to the inbred and therefore scientifically less desirable communities of New England and the Southern Atlantic States, individuals of well-determined all-American ancestry on both sides of the family for four or even for three generations are much scarcer than is generally believed. Many were found who could qualify on one side; but on the other, one or more of the grandparents were born in Europe, or else their place of birth was unknown. Nevertheless, the total study extended eventually to over fifteen hundred adults of both sexes, 937 of whom were measured and examined in detail. As regards instruments and circumstances of examination, the conditions of the investigation were ideal. The work as now completed[1] shows that the white people have approached the formation of an American type. This type is still nearest to that of its main progenitors, the British, but in stature, in physiognomy, and in behavior, it already differs more or less.

This type is a good one. It is characterized by tall stature, being the tallest of all the larger groups of white people; by, on the average, a medium pigmentation of the hair, with scarcity of adult blonds and near-absence of blacks; by prevalently mixed eyes, or light ones showing more or less of a brown admixture; by an inclination, especially in youth, to sinewy slenderness; and by other features. The main characteristics of its behavior are, in general, frankness, openness yet shrewdness, energy and persistence, with, in general, but little sentimentality or affectation, and relatively few extremes except perhaps in industrial, financial, and occasionally in religious endeavors.

This type, contrary to recent unscientific belief, is not Nordic; it is not even nearer the Nordic than it is to the Alpine. Like the British, it is an intermediate type. The head and skull are on the average mesocephalic; but there is a wide range of variation with a considerable percentage of brachycephaly. The face varies from strong in those working muscularly to decidedly subdued jaws and cheekbones in those in prevalently mental occupations. Otherwise it is a type close to the medium of English and white people in general. Already, therefore, there exists in the older stock an approach to an American type.

The next question is: How will this type be affected by the mass of immigrants who have come here since the middle of the last century? It is well known that since 1820 the composition of the immigration tide to this country has been changing. The changes are readily seen in the accompanying table.

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[1] The detailed report is to be issued by the Waverley Press, Baltimore; 600 pp. with portraits of types.

Ethnic Composition of the American Population and Immigration, 1790–1924

Nationalities	U.S. Population, 1790[1]	Nineteenth Century[2]	Immigrants 1820–1923[3]	Immigrants 1899–1924[4]
English (and Welsh)	83.5 } 90.2	15.8	24.59	9.08
Scotch	6.7			
Irish	1.6	20.2		4.73
Canada and Newfoundland		5.5	6.44	not given
German	5.6	26.2	16.24	7.70
Austria-Hungary		5.4	12.25	2.88
Dutch	2.–	not given	0.67	1.20
Norway, Sweden, and Denmark		7.5	6.47	5.59
French	0.5	not given	1.61	2.43
Italy		5.45	13.14	22.36
Jews	0.1	not given	not given	10.75
Russia and Poland (Slavs)		4.8	10.89	19.93[5]
All others	0.1	9.–		

[1] Approximates from *A Century of Population Growth in the United States.* Publications, United States Census, 1909; pp. 116–17.

[2] Immigration and Census records.

[3] From a table in Appendix 1 of the *Report of the Secretary of Labor* for the year ending June 30, 1923 (printed opposite p. 125 of the Secretary's *Report*), data on the 'Century of Migration' and brought up to date. The total migration from September 30, 1820, to June 30, 1923, is reported to have been 35,292,394. *Hearings before Committee on Immigration and Naturalization*, House of Representatives, March 8, 1924; p. 1380.

[4] United States Department of Labor, *Annual Report of the Commissioner-General of Immigration*, 1924; p. 114.

[5] All Slavs: Russians, Poles, Czecho-Slovaks, Bulgarians, Yugo-Slavs, Ruthenians.

These data show that during the last one hundred years this country has received, proportionately to its earlier ethnic components, many more Germans, Irish, Scandinavians, Italians, Slavs, and Jews, and a considerably smaller percentage of Scotch, Welsh, English, Dutch, and French. The addition of the new to the older blood, which meanwhile has probably more than quintupled through natural increase, will probably result in a population somewhat more German and Irish, with also a tinge more of Scandinavian and a stronger tinge of Italian, Slav, and Jewish blood than formerly. The great bulk of the population remains, however, in origin of descent, British, or at least Western European. This does not mean much anthropologically. The peoples here named are not distinct races. They are at most more or less recent types. No such type deserves to be called a 'race' unless this term is used loosely, though presumably the type would develop into a race or strain of distinct, fixed character if it had a chance to persist over thousands of years in isolation.

The various types of white men now existing differ from each other mainly in accordance with their composition from previous types. Thus the German type is a composite of Northwestern Europeans, Slavs, and Alpines, in perhaps not greatly differing proportions. The French type results from the admixture of Alpines, Mediterraneans, Southwestern Germanic tribes, and some Normans. The present English type is derived from the Neolithic type of man in Britain, the broad-headed Central or Western European type that reached the islands during the Bronze period, the Mediterraneans brought in during the Roman domination, the Germanic tribes of what is now Western Germany and Holland, and the Norman, French, and smaller admixtures. The Slavs are Old Europeans, modified according to locality by the Finno-Ugrians, Scandinavians, Germans, Alpines, Italians, or Turks. The Hungarians are a mixture of Slavs, Dacians, Saxons, Roumanians, Magyars, Szekels, and others. The Italians are descendants of the Latini, Greeks, Etruscans, Gauls, Goths, Slavs, Langobards, Albanians, Phœnicians, and Sards.[1] The Jews carry the blood of every people with whom they have lived.[2] And so with others. Upon analysis every larger European group, even the Nordic or Scandinavian, is found to be a composite of older groups which generally represent all the three main strains of white men, namely, the Nordic, Alpine, and Mediterranean. Most, if not all, have also more or less of a trace of the yellow-browns or blacks. Thus the Scandinavians have mixed to not a small degree with the Lapps; the substratum of the Finns and Esthonians are the Finno-Ugrians; the Russians have intermixed with the Finno-Ugrians and Tatars; traces of Mongolians are found in parts of Russia, Poland, and Germany; Hungary has its Huns and Magyars. The Semites and Mediterraneans bear here and there traces of the Africans. How inaccurate, therefore, it would be, in speaking of the various nationalities or linguistic groups of immigrants into the United States, to refer to them as 'races'; and how difficult to judge from the names of their nationalities their effect on the American type!

The problem is to determine just what these various groups of people are bringing us as regards physique and mental potentialities. To gauge the latter with any degree of success is unfortunately not yet possible except in the case of the feeble-minded; but the relative development of the head is a valuable index. On the average, in normal individuals, a head of a good size in relation to stature means a good brain; while a small head is justly regarded with suspicion.

Because of these facts it became very desirable to undertake comprehensive studies on immigrants, and with the coöperation of the Public Health Service it was possible for the author to secure, up to the time of the World War, comparable data on twelve of the immigrant groups. The same instruments and methods were used as in the studies of the Old Americans. The measurements were taken by two Public Health surgeons under my instruction and supervision. They extended, as did the studies on the male Old Americans, to healthy, adult men between twenty-four and sixty years of age. In each of ten groups, fifty individuals were measured, the remaining two groups being smaller. The question of mixture interferes in these data; nevertheless, they have proved to be of such considerable importance that it is regrettable that the examinations could not be extended to a larger series and to other immigrant groups.

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[1] See Giuffrida-Ruggeri, 'Origins of the Italians,' *American Journal of Physical Anthropology*, no. 3, 1918.

[2] See Maurice Fishberg, *The Jews*, 1911.

The results show that the bulk of the immigrants represented in our records, outside of head form and a few other features, are remarkably uniform in physique, with the exception of the Jews and the Southern Italians, both of whom are characterized by smaller stature and other more or less aberrant features. They are, in general, a good, sturdy lot. In average stature, in size of chest, and in muscular strength, they are above the mean of the Europeans. They present, as groups, no signs of physical degeneration. In the average size of the head, however, all these groups are somewhat below the *main* series of the Old Americans. This condition, which applied even to immigrants from the British Isles and which was at first perplexing, was later explained. The immigrants were artisans and laborers, generally without much education; while the main group of the Old Americans was composed of no laborers, but, on the contrary, of people of good education, with in many cases college or high professional training. When the size of the head of the immigrants relative to stature was compared with such Old Americans as the Tennessee highlanders, who were farmers, small artisans, and laborers without much education, the size of the head for a given stature in the immigrants and the Americans was found to be identical.

The main data on the Old Americans and the immigrants follow in the appended tables. These studies give no evidence that the mass of immigrants are bringing inferiority of the body nor, judging from the size of the head, inherent inferiority of the brain. Probably all that is necessary, judging by the success of the children of older immigrations and even of many of the immigrants themselves, is opportunity for wholesome development in a favorable American environment. Plainly, the immigrants are not bringing physical deterioration.

The Jews and some of the people from Asia Minor exhibit somewhat greater physical and other differences, and assimilation of these groups may be prolonged. Yet even here little, if any, danger is indicated. Many Jews already carry greater or less quantities of the blood of the people with whom they have lived. The emancipated Jews in Germany, France, and England have virtually fused with the population and are hardly distinguishable from it. With the earlier Jews in this country the results are the same. The second and third generations of the more recent Jews are already in every respect more Americans than Jews and they intermarry largely with the non-Jewish population. If the number of Jews abates somewhat from the influx that has been so marked since the nineties, no fear, it would seem, need be entertained concerning assimilation; and although this type is physically less robust than the older American or other important types, it is nevertheless plainly not a degenerate type, but one capable of rapid improvement under more favorable conditions and one that often brings exceptionally good mental qualities.

It may soberly be said, therefore, that, while certain areas of this country may become more or less colored by European strains, there is little danger that the American type will be altered for the worse, either physically or mentally, as the result of immigration, so long as we keep out the mentally abnormal and those in other ways undesirable. It is upon the detection and barring of these abnormal individuals that all possible attention should be concentrated. Outside of these, so far as scientific data can show us, there is no substantial danger to American physical and mental standards, even if the older type here and there may undergo some modifications.

Anthropometric Data on the Old Americans and Twelve Nationalistic Groups of Immigrants

Group	Number of Subjects	Mean Age (years)	Stature (c.m.)	Height Sitting (c.m.)	Proportion of Height Sitting to Stature
Old Americans (all males)...	**727**	**30.0**	**174.3**	**91.8**	**52.6**
Armenian.................	25	29.7	167.4	89.8	56.0
Croatian..................	50	35.3	171.8	91.2	53.2
English...................	20	29.3	170.2	89.5	52.6
Greek.....................	50	33.9	168.3	90.6	53.8
Hebrew (Russian)..........	50	31.5	164.6	87.5	53.1
Irish.....................	35	30.2	171.6	91.5	53.3
Italians (South)............	50	30.4	163.4	88.1	53.9
Italians (North)............	50	33.9	169.6	90.2	53.2
Hungarian.................	50	35.6	166.5	88.9	53.4
Pole......................	50	30.2	170.4	91.0	53.4
Roumanian................	50	36.5	168.7	89.7	53.2
Russian...................	50	32.0	169.8	90.4	53.3

DIMENSIONS OF THE HEAD

GROUP	NO. OF SUBJECTS	HEAD						MEAN HEIGHT INDEX	CEPHALIC MODULE	CEPHALIC MODULE *vs.* STATURE
		Length (L.)	Breadth (B.)	Height (H.)	Cephalic Index	H.–L Index	H.–B Index			
Old Americans	**727**	**19.72**	**15.36**	**13.88**	**77.95**	**70.4**	**90.4**	**79.1**	**16.33**	**93.67**
Armenian	25	18.1[1]	15.5[1]	13.7[1]	85.35[1]	75.7[1]	88.7[1]	81.7[1]	15.77	94.4
Croatian	50	18.4	15.7	13.8	85.2	75.0	88.1	81.0	15.98	93.1
English	20	19.25	15.2	13.7	78.99	71.3	90.3	79.9	16.07	94.4
Greek	50	18.7	15.1	13.8	80.85	73.6	91.1	81.4	15.87	94.5
Hebrew (Russian)	50	18.8	15.5	13.4	82.2	71.3	86.7	78.3	15.90	96.6
Irish	35	19.65	15.3	13.6	78.0	69.4	88.9	78.0	16.18	94.4
Italian (South)	50	19.1	15.1	13.6	78.8	71.0	90.1	79.4	15.93	97.3
Italian (North)	50	18.65	15.7	13.75	84.3	73.7	87.5	80.0	16.05	94.6
Hungarian	50	18.2	15.6	13.6	85.5	74.4	80.6	80.2	15.80	94.9
Pole	50	18.6	15.7	13.7	84.3	73.5	87.2	79.8	16.03	94.0
Roumanian	50	18.3	15.7	13.8	85.9	75.2	87.6	80.9	15.93	94.3
Russian	50	18.6	15.5	13.7	83.5	73.6	88.2	80.3	15.93	93.6

[1] Probably all affected by some flattening of occiput. The real measures are probably nearer *L.* 19.4; *B.* 15.2; *H.* 13.5. Average *C.I.* about 79, or a little lower.

DIMENSIONS OF THE FACE

GROUP	NUMBER OF SUBJECTS	FACE										FACIAL INDEX	
		Menton-Nasion	*vs.* Stature	*vs.* Head Length	Menton-Crinion	*vs.* Stature	Facial Module	Height of Forehead	Diam. bizyg. max.	*vs.* Head Breadth	*vs.* Stature	Morphol.	Physiogn.
Old Americans	**726**	**12.152**	**69.7**	**61.7**	**18.73**	**107.5**	**13.01**	**6.58**	**13.87**	**90.3**	**79.6**	**87.60**	**74.12**
Armenians	25	12.02	71.8	66.4[1]	18.0	107.7	13.04	6.0	14.06	90.71	84.0	77.98	85.49
Croatians	50	11.6	67.6	63.0	18.1	105.5	12.95	6.5	14.3	91.08	83.2	79.0	81.1
English	20	12.19	71.6	63.3	18.53	108.9	13.02	6.35	13.85	91.12	81.4	74.70	82.1
Greeks	50	11.52	68.3	61.5	17.9	106.4	12.71	6.4	13.9	92.05	82.6	77.65	82.73
Hungarians	50	11.47	69.1	63.2	17.8	106.9	12.79	6.3	14.1	90.38	84.7	79.21	81.55
Russian Jews	50	11.67	71.1	62.2	18.2	110.6	12.79	6.5	13.9	89.68	84.4	76.37	84.17
Irish	35	12.09	70.5	61.6	18.9	110.1	12.94	6.8	13.8	90.2	80.4	73.01	87.68
Italians (South)	50	11.56	70.7	60.5	18.0	110.2	12.73	6.55	13.9	92.05	85.1	77.22	83.09
Italians (North)	50	11.63	69.0	62.7	18.2	107.3	12.94	6.5	14.2	90.45	83.7	78.02	82.39
Poles	50	11.79	69.2	63.4	18.3	107.3	13.04	6.5	14.3	91.08	83.9	78.08	82.51
Roumanians	50	11.51	68.2	62.8	18.0	106.7	12.86	6.5	14.2	90.45	84.2	78.14	81.0
Russians	50	11.66	68.9	62.9	18.06	106.3	12.88	6.35	14.1	90.97	83.0	78.09	82.97

[1] Probably affected by shortened *L.* due to some occipital flattenings. Real probable measure, 64.0.

THE NOSE AND THE CHEST

GROUP	NUMBER OF SUBJECTS	HEIGHT OF NOSE *vs.* HEIGHT OF FACE	SUBNASAL *vs.* MENTON-NASION HEIGHT	NOSE			CHEST		
				Height to Nasion	Width max.	Nasal Index	Diameter lateral	Diameter antero-post.	Chest Index
Old Americans...	**610**	**44.1**	**55.9**	**5.36**	**3.53**	**65.6**	(246) **29.7**	(246) **21.7**	(246) **7.29**
Armenian.......	25	44.1	55.9	5.3	3.6	67.9	26.8	21.3	79.4
Croatian........	50	44.0	56.0	5.1	3.5	68.6	27.1	22.1	81.5
English.........	20	44.3	55.7	5.4	3.5	64.8	28.0	22.0	78.5
Greek..........	50	44.6	55.4	5.13	3.5	68.6	27.6	21.9	79.3
Russian (Jews)	50	45.2	54.8	5.27	3.5	66.7	25.9	20.9	80.7
Irish...........	35	42.9	57.1	5.19	3.5	67.3	28.0	21.4	76.2
Italians (South)..	50	43.5	56.5	5.02	3.6	72.0	27.3	21.0	76.9
Italians (North)..	50	43.7	56.2	5.11	3.5	68.6	27.5	21.4	77.8
Hungarians......	50	43.4	56.6	4.97	3.5	70.0	27.5	22.0	80.1
Poles...........	50	42.7	57.3	5.04	3.6	72.0	27.5	21.7	78.9
Roumanians.....	50	43.1	56.9	5.03	3.5	70.0	26.9	21.5	79.7
Russians........	50	42.5	57.5	4.95	3.6	72.7	27.8	22.6	81.3

THE HAND AND FOOT, THE EAR, AND MUSCULAR STRENGTH

GROUP	NUMBER OF SUBJECTS	LEFT HAND			LEFT FOOT			LEFT LEG (circumference)	LEFT EAR			STRENGTH (pressure)		TRACTION
		Length	Width	Hand Index	Length	Width	Foot Index		Length	Breadth	Ear Index	Right Hand	Left Hand	
					(246)	(245)	(245)	(198)	(347)	(347)	(347)	(237)	(235)	(232)
Old Americans...	**247**	**19.28**	**9.18**	**47.63**	**26.12**	**9.49**	**36.33**	**35.4**	**6.61**	**3.75**	**56.75**	**41.8**	**36.1**	**22.3**
Armenians......	25	18.8	9.2	48.94	25.8	10.2	39.53	35.8	6.3	3.7	58.2	36.4	33.8	21.9
Croatians.......	50	18.8	9.3	49.47	26.5	10.5	39.62	36.5	6.5	3.6	56.2	38.6	37.4	25.3
English.........	20	19.1	9.4	49.21	26.15	10.1	38.62	36.1	6.6	3.7	56.0	38.0		28.55
Greek..........	50	18.7	9.3	49.73	26.1	10.2	39.08	36.7	6.4	3.6	57.1	37.3	36.3	25.3
Russian Jews....	50	18.5	9.0	48.65	25.8	9.9	38.37	35.25	6.35	3.7	57.7	34.7	34.3	23.2
Irish...........	33	19.3	9.4	48.70	26.4	10.0	37.87	36.05	6.5	3.6	56.2	39.9	38.8	25.8
Italians (South)..	50	18.6	9.2	49.46	25.7	10.3	40.07	34.35	6.2	3.6	58.5	36.7	35.3	24.2
Italians (North)..	50	18.9	9.4	49.74	26.4	10.3	39.01	36.4	6.4	3.6	56.6	37.8	36.1	25.6
Hungarians......	50	18.7	9.4	50.27	26.2	10.3	39.3	36.1	6.4	3.6	56.1	37.3	35.9	25.1
Poles...........	50	19.25	9.5	49.35	26.65	10.6	39.77	37.3	6.3	3.6	57.5			25.9
Roumanians......	50	18.8	9.2	48.94	26.0	10.2	39.23	35.3	6.3	3.6	57.1	35.6	34.7	24.0
Russians........	50	18.7	9.3	49.73	26.2	10.4	39.69	37.3	6.3	3.6	57.1	38.8	37.1	25.8

CHAPTER XI

A RATIONAL IMMIGRATION POLICY

By W. W. HUSBAND

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The United States has been so assiduously engaged in formulating and perfecting restrictive measures that there has been little time for other and perhaps more constructive phases of the immigration problem. In other words, we have been tearing down; and having reached what is probably the limit, naturally the question arises what, if anything, is to be built up on the ruins of the now extinct policy of the open door.

The Federal Government, which in recent years has not been slow to take on additional burdens, did not assume control of immigration until several seaboard States had repeatedly attempted, without much success, to enforce modest regulatory measures. In 1876, the United States Supreme Court, in cases brought up from New York, California, and Louisiana, declared that the power to control immigration had been confided to Congress by the Constitution, and rather pointedly suggested that some action ought to be taken in order that 'a serious question which has long been a matter of contest and complaint may be effectively and satisfactorily settled.'

Six years later, in 1882, two Federal statutes were enacted; the Chinese Exclusion Act, and the first general immigration law. The Chinese Exclusion Law, which was radically restrictive, has served its purpose well, the

China-born population of the United States having decreased from 104,468 in 1880 to 43,560 in 1920. The general immigration law of 1882, however, was based on the theory of selection rather than restriction, and its provisions extended only to the point of denying admission to foreign lunatics, idiots, persons likely to become public charges, and convicts except those convicted of political offenses. Between 1882 and 1917, when the present general law was enacted, other classes were added from time to time until the debarred list included about every word or synonym that could be employed to denote undesirability in a human being. Nevertheless, the Act of 1917 is essentially selective rather than restrictive; although the literacy provision, added in 1917, was long advocated as a means of reducing numbers rather than as a quality test.

Had it not been for the intense anti-immigration sentiment which developed during and after the World War, it seems probable that the adoption of the literacy test might have served to postpone more radical action for at least a few years, although Senator Dillingham's per-centum limit plan, which was first proposed in 1912, was already being considered as a probable next step in the development of a policy of restriction.

After the Armistice it was, however, soon apparent that the demand for real restriction had abruptly outgrown all previous limits; and when in December, 1920, only ten days after Congress convened, the House of Representatives, with only forty-two opposing votes, passed the Johnson Bill suspending virtually all immigration, this no doubt reflected the wishes of an overwhelming majority of the people in all sections of the country. The Senate, however, living up to its traditional conservatism, substituted the Dillingham per-centum limit plan; and the much-discussed three per cent quota law of May, 1921, was the result. It is no secret that the underlying purpose was to bring about a radical restriction of immigration from Southern and Eastern Europe and the Near East, but without materially interfering with a normal or even considerably increased movement from the countries of Northern and Western Europe. As a matter of fact, the quota law was the culmination of years of effort to achieve that end. The extent to which that purpose was realized is indicated by the simple fact that in 1914, which was the last normal year under the open-door policy, a total of 915,974 immigrant aliens were admitted from the so-called new sources in Europe and the Near East, compared with 163,813 admitted under the quota law in the fiscal year 1924; whereas the number coming from Northwestern Europe increased from 164,133 in 1914 to 203,346 in 1924. Or, putting it in another way, the proportion of Northwestern European immigrants increased from 15.2 per cent of the total in 1914 to 55.4 per cent in 1924. And, it may be added incidentally, immigrants of the four English-speaking peoples increased from 8.8 per cent of the total number in 1914 to 28.3 per cent in 1924.

After an eventful three years, the Law of 1921 expired by limitation, and was succeeded by the far more restrictive legislation officially known as the Immigration Act of 1924.

This law retains the quota limit principle, but instead of quotas based on three per cent of the population of each nationality resident in the United States in 1910, as before, the Act of 1924 fixes such quotas at two per cent of the resident population as shown by the Census of 1890. Moreover, the quota area under the Act of 1921 was limited to Europe, the Near East, Africa, Australia, and New Zealand; and natives of quota countries gained immunity by residing in non-quota territory for five years. Under the new law, only Canada, Newfoundland, and independent countries of the New World are outside the pale, and natives of quota territory are counted against the allotment of the country of their birth, no matter how long they may have lived in a non-quota country.

The total quota allotment for all countries concerned is now 164,667 annually, compared to a total of 357,803 under the Act of 1921, and it is hardly necessary to explain that the reduction for the most part affects Southern and Eastern Europe, this being the obvious purpose in selecting the Census of 1890 as the population basis. As a matter of fact, the new law virtually closed the doors against this immigration, so that territory which sent us nearly 916,000 immigrants in 1914 now has aggregate quota allotments of only 20,223. The check on normal immigration from Northwestern Europe is, however, not so far-reaching, for whereas this area furnished only 164,133 immigrants in 1914, the quota allotment under the new law is 141,099.

This, then, is the immigration situation at the present time. In view of the fact that Congress in constructing the new quota law deliberated long and earnestly, there is every prospect that it will be given fair trial before important changes are made or even seriously considered. Moreover, the Act of 1924 does not become fully effective until July 1, 1927, since it is provided that after that date the annual quota of any country 'shall be a number which bears the same ratio to 150,000 as the number of inhabitants in continental United States in 1920 having that national origin bears to the number of inhabitants in continental United States in 1920.'

The importance of this provision lies in the fact that after 1927 Jamestown, Plymouth Rock, and Castle Garden, as well as Ellis Island, will be taken into account in making up immigration quotas. Moreover, by a rather free exercise of the process of elimination, the quota of 150,000 will be almost entirely confined to persons of the white race, although as a matter of fact that result is substantially accomplished under the present law. Clearly, the task of determining the national origin of the present population of the country is for the soothsayer as well as the statistician!

This, then, is the nearest approach to a definite immigration policy that has been adopted in the United States. Its obvious purpose is that the racial character of the population as it existed in 1920 shall not be materially changed by immigration.

Closing the door against Europeans practically eliminates a source which in the past has directly furnished considerably more than ninety per cent of all our immigrants. This means that for the present and immediate future, Canada, Mexico, and Cuba will be the chief recruiting grounds; but if the ban on Europe is continued, it is altogether probable that economic forces and commercial agencies, which always play so great a part in promoting immigration, will seek hitherto untilled fields among the peoples of Central and South America who are not subject to quota restrictions. The first quota law had the effect of greatly increasing immigration from Canada and Mexico; but if there is a demand for labor in the United States which cannot be met by those countries and Cuba, it seems certain that within a few years South America and Central America will become important recruiting grounds. It is an interesting fact that the immigration of Spanish-speaking peoples, including

Cubans, Mexicans, and Spanish, in the fiscal year ending June 30, 1924, was second only to the English-speaking races. Any considerable development from new sources, however, could and probably would be met by an extension of the quota area to all countries. In fact, I believe that the already scantily populated countries of the New World would be justified in making a vigorous protest against the continuance of a system which lures increasing numbers of their native populations to the United States.

In my opinion, our immigration problem will soon resolve itself into the question whether or not the country needs additional population and, if so, for what purpose. In the past our immigration has been influenced more by the necessities or desires of the peoples of foreign countries than by the demonstrated needs of the United States; but recent legislation is a virtual abandonment of the time-honored theory that America is a refuge for the oppressed, needy, or discontented of other lands. That being the case, the welfare of the United States seems the only logical basis upon which to build a future immigration policy. This in turn raises the question, What are our needs? Granted that it is desirable, as the new law provides, to perpetuate the existing status as far as national origin is concerned, the problem becomes largely a question of selection on physical, mental, moral, political, and economic grounds, within whatever limits may be prescribed.

Prior to the first quota limit act, our laws were based almost entirely on the principle of selection on the four grounds named, but in effect an opposite course was and still is followed. For not only is the law silent as to selection on grounds of economic or occupational desirability; it actually stipulates that an immigrant coming to an assured job must be excluded. There is, however, an exception to this rule, since it is provided that skilled labor may be imported if like labor cannot be found unemployed in this country; and it has seemed to me that a limited and scientifically regulated extension of this principle to the economic field as a whole would be beneficial.

I do not, however, suggest this, or any other plan, as a substitute for the quota limit system, which I believe to be sound in principle, as I know it is effective in operation. What I have in mind is something in the nature of supplemental legislation which would somewhat relieve the rigidity of the quota system, chiefly with a view to adjusting immigration to indisputable economic needs. Whether such needs actually exist at the present time is largely a matter of speculation, and probably it would be necessary to develop competent fact-finding machinery, before a flexible system of this sort could be put into successful operation. Congress has seemed to assume that there is a need for professors and ministers of religion, since only these classes are exempted from quota requirements because of occupational status. Immigrants skilled in agriculture are also preferred; but otherwise there is no attempt at adjustment to possible needs. Presumably this preference is justified, for there are some rather concrete indications that the farming population is hardly holding its own in some sections of the country. For example, only 13 per cent of the farm operators in New England are under 35 years of age and 41 per cent are 55 years of age and over. One naturally wonders what may happen in New England in the next twenty years. On the other hand, there is said to be a surplus of splendid farm families in Great Britain, Scandinavia, and Holland, who could be brought to New England if our immigration laws encouraged or even permitted it.

Another clearly demonstrated shortage is in female domestic servants. If housekeepers had been as active as farmers were when the new immigration law was under consideration, probably skilled domestics as well as skilled agriculturists would now have a preferred quota status. Joseph A. Hill has observed that the number of female domestic servants in the United States actually decreased about 30 per cent between 1910 and 1920, and had it not been for the migration of Negroes, the domestic service situation in the North would have been even worse. At the same time, as in the case of farmers, there is said to be a large oversupply of young women in Europe who, if they could, would gladly come to the United States for domestic service.

There is apparently little conclusive evidence of a real labor shortage at the present time in manufacturing and mining, in spite of the fact that comparatively few European laborers have come to the United States since the beginning of the World War, and many have returned. Experience during and since the War has seemingly demonstrated the soundness of the Immigration Commission's conclusion that there was a very considerable oversupply of unskilled labor in the industrial field, for somehow we have managed to achieve remarkable things in industry without relying on Ellis Island for a labor supply, even during the period when 4 million young men temporarily became consumers and destroyers instead of producers. To be sure, the Negro migration increased to some extent the available supply of industrial workers; but, as Dr. Hill has pointed out, in the last ten years of unrestricted immigration, 1905–14, more than 10 million immigrants entered the country, or about a million more than the entire Negro population of the Southern States. The development and more extensive use of labor-saving machinery also has resulted from the new immigrant labor shortage, and the possibilities are by no means exhausted.

While, then, there seems to be little concrete evidence of an actual labor shortage in the basic industries, a real need for labor, if it should arise, could be supplied from the very highest grade of such labor in Europe, provided we had the means of first determining the necessity and then selecting or inducing the kind of people needed to meet it. The United States spends large amounts of money in combing the world for opportunities to sell American products, and considerable sums in world-wide searches for seeds and roots to increase our agricultural production. The Government also maintains commercial agents and attachés in all parts of the world with a view to promoting American trade, and this being the case, there would seem to be no logical reason why at least some effort should not be made to regulate immigration in accordance with our actual industrial needs.

CHAPTER XII

THE IMMIGRATION PROGRAM OF CANADA

By R. H. COATS

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Immigration is the fundamental problem of Canada to-day. With other countries we have shared the exhaustion and demoralization of the War; our National debt is over 2.4 billion dollars compared with 336 million in 1914. Furthermore, we have inherited from the recent past a Government railway system as yet heavily prolific of deficits. Nevertheless, we have abundant faith in the future; we are still a 'new' country, a country of vast unoccupied spaces and undeveloped natural resources. Immigration, the key to development, is thus in the long view the most 'barometric' of present Canadian movements.

Recent Canadian expansion

It would lead too far afield to sketch the historic background to the present situation. Certain recent developments, however, may be set out for their suggestiveness, while earlier population growth may receive at least a word.

When Canada (or rather the Colony of New France) took in 1666 what we are fond of calling the first real census of modern times, the result showed some 3215 souls. One hundred years later this had grown to 75 or 80 thousand. The coming of the Loyalists after the American Revolution, together with natural increase, swelled the number to 200 thousand by 1790, the year in which the First Census of the United States gave a total just under 4 million. We began the nineteenth century — that greatest of epochs in the annals of human increase — with, say, a quarter of a million; were well on to 2.5 million by 1851; and closed with over 5.37 million in 1900, a growth of twenty times within the century, compared with one of fifteen times in the United States, and one of three times in the world at large.

It was in the twentieth century, however, and particularly in the first decade, that the most spectacular expansion of the Canadian population took place — an expansion peculiarly associated with immigration and for many reasons full of lessons for the present. The phenomenon must be envisaged neither as an immigration movement pure and simple nor as Canadian alone, but as part of the contemporary world situation. The general story is familiar enough. From causes that we need not here recall, there occurred about 1900 a great broadening of credit, resulting primarily in a movement to bring larger and ever larger areas of the earth's surface under production. Capital in huge amounts began to flow from Great Britain to undeveloped countries like Argentina, Brazil, Australia, India, and Canada. France made heavy investments in Russia and Turkey, and Germany in Austria-Hungary. The United States and Japan pursued extensive internal developments on capital of their own raising. In the case of Canada, it was of course the millions of acres of unoccupied and fertile prairies — the 'last, best West' — that chiefly attracted attention. We found ourselves drawn with unprecedented rapidity into the movement for increasing the world supply of raw materials, particularly cereals. Some measure of the growth that followed may be gathered from the fact that, of the 5.5 billion dollars of capital which Great Britain exported in the six years following 1907, more than one quarter came to Canada alone, while altogether upwards of 2.5 billion were imported between 1900 and 1914, which more than doubled foreign investment and added perhaps a third to the entire existing capital structure. The concomitant was an equally unprecedented immigration, fed from overcrowded Europe and facilitated by transportation so cheap as to be almost free.[1] In the decade 1903 to 1913, immigrant arrivals in Canada totaled 2,530,799, which was perhaps as many as had previously entered the country in all the years back to Confederation.

Of course, under circumstances so unusual, not all of our expansion was wisely directed. Though the basic objective was the placing of settlers upon the land, the accompanying railway and town building program naturally for a time took precedence. The older sections of the country turned to industrialism at a rate that outdistanced development in the primary industries. Thus, while agricultural capital went up 130 per cent and mining capital 100 per cent during this decade, manufacturing capital rose 150 per cent. Measured by resultant productivity, agriculture increased 40 per cent, and mine production 65 per cent; but there was a doubling of the manufacturing output and a trebling of transportation activities; while general merchandising and banking went up 200 per cent. The boom came to an end with the first Balkan War, which by checking the capital inflow cut off the impulse at the fountain-head. We were engaged in 1914 in a serious reappraisement of the situation, with a view to readjusting the balance of expansion and getting these large new investments on a paying basis.[1]

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[1] The statistics of Canadian immigration are published annually by the Department of Immigration. An historical conspectus and summary appears in the *Canada Year Book* issued by the Dominion Bureau of Statistics.

Then came the World War. The results were by no means purely destructive. It is gratifying to note that the liquidation of excess development was continued, and that the years which have since elapsed have gone far in redressing the situation of 1914. Notably is this the case in agriculture, where the acreage under field crops has increased from 33.4 million in 1914 to 58.2 million in 1924. In mining, likewise, we have made notable progress (*vide* Northern Ontario); our railway situation has been taken rigorously in hand; and our manufactures, as a direct result of the War, have increased in diversification and in administrative and technical efficiency. The facts that we financed our War expenditures of over two billion dollars without outside help, and that life insurance has trebled in the past ten years, are of happy augury. Immigration meanwhile sank to a point not much above a third of the immediately pre-War period.

Our general population increase in the opening decade of the twentieth century was 35 per cent, the fastest rate of any country in the world. In the second decade we grew 22 per cent, again the fastest rate with the one exception of Australia, whose growth exceeded ours by a fraction of one per cent. A century earlier the United States grew 35 per cent decade by decade till 1860, declining gradually thereafter to a growth of 22 per cent in the decade 1890–1900.

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[1] For a detailed analysis of the general economic situation in Canada throughout this decade, see vol. II of the *Report of the Official Board of Inquiry into the Cost of Living*, appointed in 1914. See also Jacob Viner, *Canada's Balance of International Indebtedness, 1900–1913*, Cambridge, 1924, reviewed by R. H. Coats in the *Journal of the American Statistical Association*, December, 1924.

The present background

Such, very briefly, is our immediate past in immigration. As will be appreciated, Canadian feeling as to the 'boom' is mixed. Yet no one believes that we permanently overshot our possibilities. Without attempting a full display of the wares which we still have to offer in the international market for population, it may be pointed out that in agriculture we have a total arable area of at least 300 million acres, of which only 141 million are now occupied in farms, with only 71 million acres improved. The free land has receded, except in Northern Ontario and Quebec, but there are large unoccupied sections contiguous to the railways under private ownership in the West, present policy being to bring these into use before opening up localities that require additional railway construction. Under forest we have 1.2 million square miles, 40 per cent covered with merchantable timber — the second greatest timber reserve of the world. We also have vast areas that are indubitably highly mineralized, the possibilities of which have been no more than scratched; in coal, for instance, our Western bituminous, sub-bituminous, and lignite deposits are estimated at 16 per cent of the world's known reserves. Our fisheries are the second most valuable of the globe; and in water power we have a possible turbine installation of 41 million horse power, of which only 8 per cent has been developed. Our national wealth, reckoned by the inventory method which excludes undeveloped natural resources, is but 22 billion dollars, which, viewed as the superstructure on half a continent, is low. All this, of course, is hedged about with considerations. Yet, with the world becoming more and more an economic unit, and in face of the defective distribution of population which obtains at present (Canada with one sixteenth of the earth's land surface has but one half of one per cent of the world's population), it will be admitted that the Dominion seems *a priori* entitled to a movement in her direction.

Official methods and policy

Perhaps the best approach to a purview within reasonable compass of the Canadian immigration program is by way of an outline of what may be termed its technique or official methods. These may be contrasted with the methods of the United States, which are conceived from an entirely different standpoint. Canadian immigration policy, it may be premised, is directed by a separate and distinct department of government, with a minister of its own.

First, Canada encourages immigration and carries on active propaganda to that end. The United States does not. A Canadian 'Director of Immigration' is maintained in London, England, with sub-officers throughout the British Isles; in addition, various agencies are stationed on the Continent of Europe, mainly in Northwestern Europe, from Scandinavia southward to France and Switzerland, and to a lesser extent in Germany, Russia, and what was Austria-Hungary. We have agencies also in the eastern, central, and western (but not the southern) divisions of the United States. These officers go after the eligible settler, by lectures, motion-pictures, and advertisements; they also act as guides to intending immigrants and as a first check on undesirables. Feeding and supplementing this organization a vigorous publicity campaign is conducted from headquarters. Encouragement even goes to the length of assisted passages, under conditions that will be mentioned farther on, and to the bringing of colonists to jobs secured before arrival. The United States, to repeat, does none of these things; under her alien labor law, indeed, the fact that an immigrant has a job to go to is enough to debar his entry.

Second, the control of immigration is achieved differently in the two countries. They have broadly similar regulations for the rejection of such classes as imbeciles, defectives, diseased, criminals, vagrants, anarchists, drug addicts, and illiterates. (Thanks to supervision abroad, the number of rejections in Canada has been reduced to a minimum.) From this point, however, their policies diverge. The United States has established a quota; no matter how desirable the individual of a given nationality may be as a prospective citizen, he cannot come in once the quota has been filled. On the contrary, Canada's restrictive policy is not numerical or quantitative, but qualitative, being based on occupation and general suitability, the latter, of course, to a certain extent measured by country of origin. We desire only agriculturists with capital, farm laborers, and domestic servants; but we also admit certain other classes, such as the wives and dependents, in good health, of persons legally domiciled in Canada; United States citizens for whose labor there is a demand; and British nationals from various parts of the Empire, who have sufficient means to maintain themselves until they can find employment. Thus there is no restriction on arrivals in Canada from, say, Sweden, as such. Orientals, however, we all but exclude, and Southern and Southeastern Europeans are rigidly scrutinized. We believe this a more scientific procedure than to base rejections on numbers alone, which may not even maintain the *status quo* where the outward-bound movement is considerable or irregular.

Third, extensive machinery has been provided in Canada for the supervision of immigrants subsequent to their arrival. Their selection and direction begins, as already stated, in the home country. This contact is continued on board ship. On landing, the coöperation of various religious bodies and of such organizations as the Y.M.C.A., the Y.W.C.A., and the Canadian Red Cross is enlisted. 'Commissioners of Immigration' for the Eastern, Western, and Pacific divisions of Canada direct this work. A Land Settlement Branch, which has field representatives throughout Canada, assists the settler in selecting his farm or in getting into touch with agencies from which he can secure experience while safe from exploitation. A division for the special assistance of female immigrants and the after-care of women workers has been set up. Juvenile immigration is under a 'Supervisor' who maintains contact with children placed throughout the country until they reach the age of eighteen. Other branches of the Government actively aid the immigrant. Several Provincial Governments — not to mention private organizations like the two great railway systems — have engaged in the distribution and settlement of immigrants. So far as I know, the United States has no organized counterpart to these activities. It has been stated — with how much truth I am unaware — that more than 50 per cent of the recent immigrants into the United States have settled within an hour's run of the port of New York.

In fine, the United States no longer courts the rôle of melting-pot; Canada still does, but she will melt only the raw materials she requires for nationhood.

The immediate program

For various reasons immigration into Canada has been comparatively light since 1920. In the first place, demobilization brought a surplus of native labor to Canada;

the returned soldier and his reëstablishment became the first care of the Canadian Government. But there were equally powerful influences at work at the other end. In the British Isles, notwithstanding the prevailing unemployment, the improvement in social conditions during recent years, as illustrated by old age pensions, health insurance, and unemployment doles, militates against emigration. It is a far cry from the time when Scottish crofters and Irish tenant farmers were being evicted and driven overseas, or when English agricultural laborers were being forced out by starvation wages and the shadow of the poorhouse. As for Continental Europe, the great rise in transportation costs and the demoralization of the exchanges have worked to the same result; the people have been too poor to think of emigrating, while fear and suspicion as to their reception have played their part in the erstwhile enemy countries.

The immigration problem involves conditions that are more than national in scope. If these forces are something less than 'cosmic,' in the phrase of a recent writer, they at least include the settlement of Europe, the restoration of the machinery of trade and interchange, and the general recovery of international good-will, which will permit the flow of population once more to seek its level. At the same time *laissez faire* as formerly practiced on this continent is gone forever. In Canada even before the War, an unwelcome change had shown itself in the quality of our immigration; from an almost purely British and Northern-European movement, it had come by 1914 to include an admixture of races lacking the pioneer spirit and the aptitude or desire for the land settlement on which our progress depends. To-day the tendency to immediate Government control is marked. A sign of the times is the so-called Empire Settlement Scheme, started early in 1921 under the joint direction of the British and Dominion Governments, specially designed to encourage that individual handling of the British emigrant to which reference has been made. Since April, 1922, the two Governments have been coöperating by assisted passages in the movement of selected emigrants to Canada — farmers, farm laborers, houseworkers, and juveniles. In the case of an adult, a passage loan is made, repayable within reasonable limits; for a child free passage is arranged, the Governments sharing the expense equally. The coöperation of certain Provincial Governments has been enlisted, British Columbia having entered into an agreement for the settling of a number of Scottish fishermen, while Alberta has agreed to take a number of British lads, train them in a Provincial agricultural school, and place them afterwards with selected farmers. The chief feature of the scheme, however, has been an arrangement whereby it is expected to transplant three thousand British families to farms in Canada. The British Government will provide cash advances for equipment up to $1500, which is to be refunded within a reasonable time. On arrival in Canada, these families will not be allowed to shift for themselves, but will be taken through to their destinations and placed either on farms with suitable buildings already erected, or with employers who will give them the necessary training.

Though no system of financial assistance for passage or settlement is offered to others than those from England, Wales, Scotland, and Northern Ireland, the Department provides the same machinery for the protection and guidance of every newcomer after arrival. In order to control the movement from certain Continental countries and prevent the admission under the guise of farm workers of those whose real destination is the city, there has been adopted a form of application for the employer in Canada. On investigation, the Department issues a letter to the proposed immigrant for visé by the Canadian inspector in his vicinity. This assures the newcomer of a definite situation immediately on arrival.

With immigration must go some movement of capital. It is more than a coincidence that the proportion of British capital going outside the Empire is usually equal to the proportion of British emigrant labor similarly going outside.[1] Even the Loyalists a century and a half ago were not settled without liberal subventions. Capital importation is under less surveillance to-day than immigration, but we are miles away from the attitude of 1900–14. For some years past we have received little or nothing in the way of capital from Great Britain, though in 1922 she exported £155 million according to the United Kingdom Board of Trade, and in 1923 the movement was almost as great. On the other hand, out of $481,850,000 of Canadian bonds issued in 1922, 53.84 per cent were placed in the United States, less than 1 per cent in Great Britain, and the rest in Canada; in 1923, however, out of $493,143,000, only 17.2 per cent were placed in the United States and 82.2 per cent in Canada. Such figures are full of meaning for the immigration movement broadly considered. From a narrower standpoint it may be added that putting settlers without money on the land is no longer thought feasible in Canada.

The broad Canadian objective at the present time is so to increase population within the next few years that our railway problem may automatically disappear and that we may securely dominate our War taxation. An early increase of three million people would meet immediate requirements. (This, of course, is not an 'optimum' figure; still less is it a projection of the Pearl and Reed curve.) Not more than half this number can come from natural increase; for the rest we must count on immigration. A movement of, say, from 200 to 250 thousand a year is about our need. With the situation described in Britain, where nearly a quarter of a million are being added to the working population annually and 40 per cent of emigration is outside the British Commonwealth, it should not be hard to reach that figure. We are nearer to Europe than any similar field for colonization, and this means lower transportation rates and easier access. We have lower taxes per capita than the other British Dominions; while, compared with the United States, living is cheaper and our cultural standards in such matters as divorce and the general observance of law and order are higher. Recalling what we have done on occasion in the past, our program is not overambitious. Certainly it is engaging more thought than at any previous time.

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[1] See C. K. Hobson, *The Export of Capital*, especially chap. VIII.

Retention of immigrants

Immigrants are of little use unless retained and assimilated. The United States Immigration Commission in 1910 found that no less than 40 per cent of the immigrants to the United States left the country after a comparatively brief stay. For Canada the percentage is doubtless higher. The reasons are obvious. In the first place, our close proximity to the United States with its (1) vast attracting power upon a mobile and virile population — especially as the two countries speak the same language and have the same general institutions — is probably without parallel. In the second place, the relatively early stage of Canadian development pre-supposes that in prosperous years a considerable proportion are attracted by the new work in progress rather than by the prospect of permanent settlement. This was particularly the case from 1900 to 1914. Even without the Census, which periodically disappoints Canadians owing to intercensal overemphasis of gross immigration, one could have argued statistically during those years that a large part of our immigration really represented a short-time loan of labor by Europe. Foreign money orders, for example, might have been cited. These represent in the main two classes of business: small purchases abroad and remittances to friends. Now the former, in the case of Canada, are almost entirely confined to the United States and Great Britain. When, therefore, we saw our money orders to countries like Sweden, Austria, and Italy mounting by leaps and bounds, we might have known that the immigrants from these countries had not permanently severed their native connection. These remittances stopped abruptly with the completion of the railway and town-building program, when we also found through the Census that the immigrants themselves had largely stolen away.

What is our loss by emigration? In the opening decade of the century, natural increase (853,566) and immigration (1,847,651) would have brought our population to 8,072,532; whereas the Census found only 7,206,643. The difference of 865,889 we call our loss by emigration. Similarly in the decade 1911–21, though 1,728,921 immigrants were chronicled as arriving in Canada, there was an emigration of 1,297,740,[1] largely to be charged against the immigrant during the depression of 1913 and in the period immediately following the outbreak of war.

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[1] This figure, however, includes the 60 thousand Canadian lives lost at the front and the soldiers (about 20 thousand) enlisting in the Canadian forces who received their discharges in the United Kingdom.

One of the urgent requirements in Canada, therefore, is a scheme of emigration statistics properly coördinated with immigration and other demographic statistics. We have lately reorganized our vital statistics, and we have records of immigration capable of check with foreign statistics. Moreover, both these systems are in coördination with the Census on such points as definitions of nationalities and ethnic stocks, classification of occupations, and age groupings. But with emigration missing, the arch falls to the ground. Departures by sea offer little difficulty. The scheme I suggest regarding our interchange with the United States is a daily pooling of data between the American and Canadian officials along the boundary, which would permit a consensus as to the real balance. As long ago as 1911, a United States Immigration Commissioner reckoned that 9 million people cross annually from the one country to the other. Clearly, in such a total there is room for serious miscalculation.

This leads at once to the topic of the United States figures of immigration from Canada. Frankly we are not easy in our minds as to their validity. Many Canadian industries are of a seasonal character; the labor market of the two countries is coterminous and interlocking to an exceptional degree, the typical Canadian labor union being international and issuing traveling cards that are valid in the United States. We are convinced that many a good Canadian is entered as a United States immigrant, though the turn of the wheel finds him duly back in Canada. We have a story of a French-Canadian farmer who, by working for successive winters in the Maine bush, got himself put down as several American immigrants. To cite the present situation: our 1924 estimate of the population of Canada (by a series of curves fitted to the known progressions of the several Provinces during a number of decades back) works out at about 9.2 million, an increase of 438 thousand over the Census of 1921. Now our natural increase in the meantime was 445 thousand, and our immigration 311 thousand. Thus our emigration must have been around 318 thousand. But the United States immigration returns from Canada total 364.5 thousand. Beginning with April, 1924, however, our Immigration Department has kept track of returning Canadians of the kind above specified and finds that in seven months alone they have numbered 31 thousand. It is inconceivable that this movement did not exist in 1922 and 1923. We feel justified, therefore, since the British net figures confirm our immigration returns, and since we know there has been little movement back to Continental Europe, in regarding our estimate as safer than the statistics of the United States, the more so as it is buttressed by such a constant as school attendance, which shows an 8 per cent increase in two of the years. Finally, it may be noted that, while the United States statistics show an immigration of 750 thousand Canadians to the United States in the decade 1910–20, the figures of the United States Census show a reduction of about 78 thousand in the Canadian-born population of the United States in the latter year as compared with the former. Of course the two sets of figures are not on all fours, but no estimation of death-rates of Canadian-born in the United States and of the proportions of Canadian- and foreign-born in our emigration can make so wide a discrepancy reasonable. This is further borne out by the figures pertaining to French-Canadian immigrants, which strongly point to overstatement in the United States immigration returns.

Conditions in this respect have been intensified of late by the operation of the quota law, which does not apply to persons born in Canada. In the year before the War, United States immigration amounted to over 1.2 million souls. The first quota law cut this down to 360 thousand, and the later amendment to under 160 thousand. Undoubtedly, the effect has been to create a labor vacuum whose powers of suction have been chiefly exercised upon Canada. But I am interested here mainly in the statistical effect, which would naturally be to increase the number of improperly classified Canadian entrants, following upon increased vigilance by officials lest Canada be made a side-door for Europeans. Of course, as the Secretary for Labor has recently said, it may have swelled the numbers who have evaded the authorities altogether.

Assimilation

Assimilation is hard to measure statistically. The backbone of Canadian immigration is not alien, but British, and needs no assimilation. Our second source of supply, the United States, is also in a category that is 'different.'

Naturalization is the first step in assimilation. Of our total population of 8,788,483 in 1921, only 890,292 were foreign-born, of whom 374,024 were born in the United States. Of the foreign-born, 57.75 per cent (males, 52.36 per cent; females, 65.31 per cent) had become naturalized; in other words, we had but 376,100 unnaturalized foreign-born in our population, and of these one third were Americans.

The time lapse between immigration and naturalization is interesting and may be studied in the Census returns of the citizenship of the foreign-born according to year of arrival in Canada.[1] It shows the leaven continuously at work; after ten years, only about 30 per cent remain unnaturalized.

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[1] See *Sixth Census of Canada*, 1921; vol. II, p. 423.

The tendency toward naturalization as between different countries of birth is also important. Our experience is that, of the European-born outside of the British Isles, 42.12 per cent remained outside the pale of citizenship in 1921. This figure ranged from 13.64 per cent in the case of Icelanders, through 30 per cent for Norwegians and Swedes, 34.11 per cent for Germans, 40.61 per cent for Austrians, to as high as 66.34 per cent for Jugo-Slavs, 70.68 per cent for Greeks, and 77.61 per cent for Bulgarians. Of Asiatics, 84.14 per cent were unnaturalized; but of immigrants from the United States only 36.37 per cent had not taken out papers.

Naturalization, however, is not necessarily the deeper process. Of all assimilating forces the greatest is education. Perhaps, therefore, the significant fact in the whole Census, in this connection, is to be found in the illiteracy returns. For the study of this feature the statistics of the seventeen groups of foreign-born (aggregating 365,838 persons) which showed the highest illiteracy rate were segregated. The rate was found to be 24.8 per cent. But the 103,101 children of these same immigrants, born in Canada, showed an illiteracy rate of only 5.1 per cent, or virtually the same as the Canadian population in general. Our foreign-born, in fact, show very nearly as large a proportion in school attendance between the ages of 7 and 15 as any other element in the population, a striking tribute to the energy and success with which school and child-welfare agencies in Canada are tackling the problem of Canadianization. Further illiteracy statistics have likewise a bearing on immigration: the element of the Canadian-born population showing the lowest percentage of illiteracy is that which has one parent Canadian and the other British. In 1921, there were in this category 375,068 persons over 10 years of age whose illiteracy was 1.08 per cent as compared with 1.25 per cent in the next lowest class, namely, persons both of whose parents were British-born. In other words, the hope of the rising generation from this standpoint appears to be in an admixture of British stock — which is the chief element in our immigration.[1]

A less assuring sidelight on assimilation is thrown by our annual criminal statistics, of which we have a tolerably complete system in Canada. In 1921, there were 227 convictions for indictable offenses per 100,000 of the Canadian population of age 16 and over. The highest rate occurred among the foreign-born; the next highest among those born in the United States; while the British-born and the native Canadian-born carried off the palm with rates around 200. The foreign-born outside of the United States showed worst in offenses against the person and against property, with or without violence; but in forgery and offenses against the currency they yielded place to those born in the United States.

The problem of the unassimilable Oriental we share with the United States, in addition to some complications on account of India. As said above, we exclude Orientals: in the case of Chinese, by requiring possession of $250 of their own money as a condition of entry, a demand which has reduced the inflow to an occasional wife or child and a few students; in the case of the Japanese, by a 'gentlemen's agreement'; and in the case of the East Indians, by insisting that immigrants must come direct from India on a through ticket. In 1921, we had 39,587 Chinese, 15,868 Japanese, and 1016 East Indians in Canada, most of them in British Columbia. The Japanese have brought their women and are multiplying; their births numbered 618 in 1921. There are others, like the Mennonites, who have remained a class unto themselves; but their segregation has been religious rather than racial.

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[1] The Bureau of Statistics is bringing out a special study of illiteracy, which pursues the theme into a number of byways and throws light on assimilation processes. For instance, the racial characteristics of illiteracy are found relatively quite strong in the third generation — so hard is it to eradicate 'what's bred in the bone.'

The presence of the United States immigrant and settler in Canada draws attention to a detail in statistical practice in which the two countries differ. The Canadian Census records 'racial origin' as well as birthplace and nationality. (The term is of geographical rather than of true ethnical or biological significance.) Thus we know that, by racial origin, 55.40 per cent of the Canadian population are British, 27.91 French, and 1.26 aboriginal, leaving 15.43 of alien stock; we know also how our birthrate is progressing according to the origins of both parents, and how our people of different racial stocks are intermarrying. For the Americans born in Canada, therefore, we can supply an analysis lacking in their own country. Of the 374,024 people in Canada in 1921 born in the United States (237,994, or 63 per cent, being now naturalized Canadians), 205,189 were found of ultimate British extraction, and 50,630 of French, the latter no doubt children of French-Canadian emigrants to the United States. Accordingly, we reckon 255,819 of our United-States-born as of like origin with the main body of Canadians. In addition, however, they included an infiltration of 40,099 of German, 22,186 of Norwegian, and 11,625 of Swedish strain.

CHAPTER XIII

IMMIGRATION AND NATIONAL LIFE

By ALEXANDER GOLDENWEISER

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All countries have been peopled by immigrants — some more continuously and some more recently than others. Our own ancestors, composed of varied stocks, came from the Old World across the Atlantic to mix with, and ultimately replace, the Indian. The habits of thought and the customs brought by these different peoples have played an essential part in shaping our National life. Even though our culture now represents a fairly uniform conglomerate, many of its component elements can still be traced back to their original foreign sources. England, for example, has provided the model for our political system, theoretically as well as practically; and our educational methods, our literature, our ideals of manhood, and the current social amenities are also predominantly English. The Irish, though less influential in shaping the theoretical foundation of our system, have probably exerted the most powerful control over the actual workings of our political life. They have also indelibly influenced our religious institutionalism through the channels of the Catholic Church. The Germans have helped to shape our technique of business and have made substantial additions to our professional life, especially in the fields of science, medicine, and music. The Scandinavians and the Scotch have done much for skilled craftsmanship and agricultural progress. The Jew has proved a mighty stimulus to intellectual life, particularly in our Eastern

States; he has encouraged political progressiveness and has helped to establish organized labor on a sounder foundation. He has shown great effectiveness in some types of semi-skilled and skilled labor. The Italian has performed a large part of our manual labor and, like the German, has made a real contribution in elevating musical taste. The ranks of unskilled labor have also been fed by Poles, Bohemians, and other Slavs. The Bohemians, moreover, deserve to be placed beside the Scandinavians for their contributions to skilled industry.

Nor must we forget the Indian, the ancient master of this land, who was the host of the early European settlers; for he has served us well by opening up a singularly rich and exotic civilization. He shaped the character of frontier life and made substantial contributions to certain aspects of agriculture, such as the cultivation of corn. Finally, the Negro made possible the culture and aristocracy of the Old South. He deserves recognition, so far but grudgingly granted, for his part in our industrial development and for enlivening our National life with lighter music, folk-song, acting, and the dance.

Even this brief enumeration suffices to make clear that we are a nation of immigrants and that these immigrants have made us what we are.

From the very beginning of time men and groups of men have migrated, emigrated, and immigrated; and history has repeatedly shown that, whenever these movements took place, problems arose. Culture was influenced, prejudices were aroused, and policies of one type or another were framed to invite, check, or control, in some way, the flow of humanity. That is what has happened in this country. The newcomer, who was first regarded as an equal and helpmate, was later looked upon as a foreigner, an intruder, and an inferior. Immigration, once considered the hope of the Nation, is now thought of as a National menace. There was opposition, on the part of the Indian, to the coming of the Spaniards, Portuguese, French, Dutch, and English; and the responsibility for this attitude was not wholly the fault of the original American. Then came the German and the Irish immigrations, which aroused considerable hostility; the Irish, especially, suffered from social ostracism and even persecution. But it was not long before the Germans and the Irish were foreigners no longer. They soon became good Americans, native sons and builders of the Nation. The United States with its sparsely populated territory needed additional inhabitants; and so it came about that the earlier settlers were, in due time, followed by the Jew, the Pole, the Italian, the Bohemian, and, on the Pacific Coast, by the Asiatic. They came in ever-increasing numbers. Immigration ceased to be merely an aspect of an historic process; it became a problem which is still with us.

The first form taken by the modern anti-immigrant sentiment was shaped by the conditions of labor. The argument ran that the immigrant, with his lower standards, could easily replace the American laborer. Every immigrant, it was often said, robs a native American of his job. When the late Isaac Hourwich pointed out that the premises upon which this theory was based were erroneous, he received but scant hearing. In his numerous articles, and especially in his memorable *Immigration and Labor*, he insisted that the tides of immigration were self-regulatory; that the immigrant was mainly guided by what he heard from his relatives in this country; that periods of business prosperity and industrial expansion invariably led to an increase in the number of immigrants, just as business depression, the spread of unemployment, and like considerations automatically served to check immigration. The argument was unassailable; but it was powerless to counteract the growing sentiment that immigration was in some way responsible for the demoralization of the industrial and labor market.

During the War, a new twist was given to the anti-immigrant sentiment by the spread of a doctrine now currently known as 'the Nordic myth.' This doctrine represents an atavistic offshoot of a racial theory once made famous by Count de Gobineau, later transformed into a philosophy of history by Houston Stewart Chamberlain, and finally adjusted to the needs of a practical policy by such writers, in this country, as Madison Grant, Lothrop Stoddard, William McDougall, and Edwin Grant Conklin. The last two authors are perhaps less enamoured with the idea of Nordic supremacy; but they represent two points of view, one biological, the other psychological, from which our Nordicizing enthusiasts have received solace and inspiration.

What, then, is the Nordic myth? It teaches that, of the three sub-racial stocks of Europe, the Mediterranean, the Alpine, and the Nordic, only the last possesses to an eminent degree those hereditary qualities which stand for military valor, political competence, and 'character.' The biological doctrine which seemed to many people to warrant this view is known as 'eugenics.' The psychological point of view which did similar service is embodied in the so-called 'psychological tests.'

At the root of the biological doctrine lies the conception that the human germ cell is completely isolated from the rest of the organism and is, therefore, immune to educational influence, in fact permanent and immutable in its properties, which are passed on unchanged from generation to generation. The eugenists teach that the human stock can be improved only in a positive or a negative manner. The negative method consists in making war upon the multiplication of inferior germ cells by reducing or checking the mating of physical and mental defectives. The positive method is a system of selective mating. While only a few people hold such a drastic form of the eugenic theory, this general biological outlook has greatly influenced current views regarding differences between individuals and groups, especially as these bear upon the problem of education *versus* biological selection. If some of the immigrant groups who reach our shores are indeed the carriers of inferior germ plasm, then their arrival must lead to National deterioration.

This attitude was reinforced by theories emanating from the laboratories of experimental psychologists, who developed a new method of classifying and grading individuals — psychological testing. The tests, first applied on a large scale by the War Department, revealed surprising variations in mental capacity between privates and officers, between natives and foreigners of different nationalities, and between Whites and Negroes. Some writers maintained that psychological capacities, as reflected by the tests, were only slightly influenced by education or training and were primarily hereditary, since the relative grading of individuals in a group changed but little with years. The most important revelations of the War Department tests were that the performance of all foreign peoples, with the possible exception of the English, compared unfavorably with native Americans, and that Negroes were inferior to white Americans. If these findings are taken at their face value, the inevitable result must be an attitude of extreme caution toward an immigration which might flood the country with psychologically inferior inhabitants.

How do these biological and psychological theories fare in the light of criticism? With reference to eugenics, it must be stated somewhat didactically that most of the ambitious generalizations so far reached are largely built on thin air, or, at best, on faulty analogies between the phenomena of animal breeding and the biological life of man. The very theory of the isolated germ cell is, after all, but a theory which seems to fit into the structure of modern biology, but which may undergo radical transformation if additional facts pertaining to the life of organisms are revealed. In the second place, no one has yet succeeded in probing the total potentialities of a germ cell; and human experience has shown that individuals who are apparently inferior under one set of social conditions suddenly reveal higher or even superior qualities when the social conditions are changed. Moreover, in dealing with the breeding of animals, the one objective is to enhance, reduce, or otherwise affect the development of a particular physical trait or complex of traits, such as speed, strength, size, weight, or shape. In the case of man, the problems increase in complexity and shift from the purely physical to the psychological. We can only speculate about how closely the psychological factors involved are comparable with the physical ones in their heredity aspects and in their amenability to selection. It is, therefore, theoretically premature and certainly unwise to utilize this biological outlook as an ideological premise of any practical policy. That human individuals differ at birth, physically as well as psychologically, cannot be doubted. The extent to which ultimate success and achievement depend on such inborn qualities is problematic; as is also the degree to which education can transform or make use of a given native endowment. We must, therefore, suspend judgment on this whole set of problems.

Now a word about the psychological testers and their findings concerning the nature of human intelligence and its distribution. That the psychological tests are valuable tools cannot be doubted. Also, it must be admitted that the facts favor the theory that some of the traits revealed by psychological tests are due to heredity and not to education. On the other hand, the extravagant conclusions must be checked. The tests are so devised as to test only some of the more elementary qualities of the mind, such as sensation, association, memory, certain aspects of common sense, and a kind of mental agility which can be described as word-puzzle mentality, the knack of finding an answer or solution to a puzzling or twisted situation. The tests, to date, fail utterly to provide a measure for a wide set of human qualities and aptitudes, such as power of abstraction, creativeness or inventiveness, or any of the emotional qualities. In other words, the psychological tests tell us next to nothing about the more complex traits of human beings. As a method of grading individuals, the tests will pass muster; but they are not adequate measures of the psychic individual. There is, moreover, no certainty that the foreigner, especially one with an incomplete command of English, is treated fairly when expected to qualify on a par with a native American. The tests for individuals of different nationalities should be given in their respective languages and devised to reflect the cultural conditions and habits prevailing in their respective countries. Such a check on the validity of the tests has not yet been made.

In order to define clearly the only attitude regarding the problem of race and cultural differences and potentialities which, with our present knowledge, seems justifiable, it is necessary to review briefly the results of anthropological work in this field, and certain conclusions that can be drawn from an estimate of the historic achievements of different racial groups. From a biological standpoint, races certainly cannot be arranged in a series which would represent an ascending scale of development from the animal upward. It is true that certain apparently animalistic traits, such as the prognathic jaw of the Negro, are more pronounced in one race than in another. But the very Negro who exhibits the prognathic jaw also possesses the very large, red, external lip, which is a specific human characteristic. In this, then, he is further removed from the animal than any of the other races. Again, hairiness, which is presumably an animalistic trait, is equally characteristic of both the Australian, whose culture is among the crudest, and of the white man; whereas the Negro, the Indian, and the Mongolian are distinguished by a relative scarcity of hair on face and body. All that can be said is that the races, developing biologically in different directions, represent specializations from a common animal prototype. There can be no question of inferiority or of superiority.

The situation is equally problematic with reference to the nervous system, especially as regards the brain. The only races from which a sufficient number of brains for definite conclusions have been examined are the white and the Negro; and here the results indicate that if a given number of Negro brains is compared with an equal number of white brains, the majority of the brains in the two sets will be found to vary within the same limits. On the other hand, a very small number of Negro brains will be smaller and lighter than any normal white man's brain; and an equally small number of white men's brains will be larger and heavier than any normal Negro brain.

However, an attempt to correlate this difference with psychological traits, especially with intelligence, will result in disappointment for the advocate of race superiority; for the relation between intelligence and the size and weight of brain, within the limits of human variation, remains highly problematic. The facts thus far disclosed justify the prediction that a series of, say, a thousand brains belonging to men and women of distinction, would not in point of weight and size differ significantly from a thousand brains belonging to individuals of no special capacity or achievement. That this should be so is not surprising in view of two obvious facts: (1) Whatever its relationship to intelligence, the brain is certainly related to the size and weight of the body. Everything else being equal, a large and heavy body carries with it a large and heavy brain. Thus, our baseball and football players without doubt possess some of the heaviest and largest brains of the Nation. But are they also our leaders intellectually? (2) The brain can be called the organ of thought only euphemistically, for thinking or intelligence is only one of the numerous functions of the brain, some of the others being nervous and muscular coördinations in the body, the control of the internal organs, and central representation for the emotions — functions related to intelligence, either indirectly or not at all. It is, therefore, to be expected that the correlation between intelligence and brain size and weight will be at best hard to detect.

From the standpoint of psychology, the traits so often ascribed to racial and national groups are due, as can readily be shown, to tradition and social setting rather than to heredity. Take, for example, these currently accepted traits: the American Indian is stolid; the Mongolian has marvelous reserve and self-control; the Negro is emotional and lacking in the qualities of persistence and in ability to govern himself. Now none of these supposed racial characteristics is hereditary; one and all, they represent the result of cultural habituation. The stolidity of the Indian is nothing but ceremonial form; the reserve of the Mongolian is a carefully nurtured trait, demanded by public opinion and developed by education; while the emotional instability and the apparent laziness and unruliness of the Negro can readily be explained by the abnormal social and economic conditions of his American environment. In the congenial setting of his native cultures, these traits are not conspicuous.

We are equally prone to ascribe to heredity the differences in national psychology, whereas educational agencies and national traditions are obviously the explanatory factors. We think of the German as uncouth, rude, inclined to metaphysics and sentimentality, and willing to endure almost any amount of governmental control. The Frenchman is characterized by his brilliance of utterance, the cold logic of his mind, his politeness and æsthetic proclivities. The Englishman is noted for his reserve, almost equaling that of the Oriental, his unemotionalism, his business acumen, his inability to see a joke, his inefficiency under ordinary conditions, and his extraordinary talent for organization when an emergency arises. The Russian is introspective, self-critical, incapable of practical achievement, given to emphasis and exaggeration in conversation, and morally unstable and unreliable. These traits are characteristic of such wide classes of people in the respective countries that the temptation to ascribe them to inborn qualities is hard to resist. A more critical approach, however, invariably reveals the fallacy involved, for these supposed congenital traits tend to weaken in the first generation and usually completely disappear in the second, whenever a group is transplanted to a new cultural environment. This is also true of the so-called 'racial traits.'[1]

Let us turn now to our actual cultural achievement. In our racial pride and in the consciousness of the superior worth of our standards and ideals, we are overconfident of the superiority of our civilization. Here a little less subjectivity is sorely needed. It is true that we possess a large accumulation of objective knowledge and a scientific system which is characterized by exact methods and critical procedure. It is true, also, that we apply such knowledge to thought and philosophy and to the affairs of practical life. In the so-called 'applied sciences' our superiority cannot be disputed. But can as much be said for our religion, art, literature, morality, or political and economic organization? No sooner is the problem put in this way than it becomes clear that achievement in these fields can be evaluated only in the light of definite standards, and that such standards are inevitably subjective.

The Chinaman, the Arab, the Hindu, and even the Negro, need not fear the evidence of history. In religion, morality, art, literature, philosophy, and social form, they have achieved solutions and established values which can stand comparison with those of any historic people. And if this is so, is it not obvious that the dogmatic discrimination within the white race between the so-called Nordics on the one hand, and the Alpines and

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[1] This formulation of the problem of the assumed psychological differences between racial groups should not be interpreted as a dogmatic assertion of the identity of all human groups in psychological potentialities. In view of the great physical differentiation of the races, such psychological identity is, in fact, exceedingly unlikely. On the contrary, it is most probable that differences exist and may some day be revealed. At present, however, we do not know what they are or even may be, nor is it in the least probable that these differences, when revealed, will be such as to permit a classification of the races into superior and inferior.

Mediterraneans on the other, is a product of prejudice and uncritical thinking, not of observation and objective inference?

We are now ready to examine critically our present immigration policy. This is dominated by the conviction that certain European nations are psychologically or culturally inferior to others. We discriminate, therefore, against the Eastern and Southern groups in favor of the Northern and Western groups. It is assumed that immigration is a national problem which each nation has a right to settle as its own convenience dictates. It is also held that, to be successful, a national culture must be uniform and homogeneous; that cultural diversity and difference in outlook and in habits of living disperse national consciousness and result in cultural chaos, lack of solidarity, and national weakness.

On the basis of this theoretical viewpoint, the immigrant is subjected, first, to the restrictions of a discriminating immigration law, and then to an emphatic process of Americanization, which aims to transform him as quickly as possible into a full-fledged American. Characteristic of this process are the hostility toward the native language of the immigrant and the hurriedness of the naturalization process. It is believed, moreover, that an immigrant who resides here for a number of years and then returns to his fatherland is guilty of an act of supreme egotism; that he comes here, gets out of this rich land whatever he can without giving anything in return, and then goes back to his native land to enjoy the fruits of his labors.

All these postulates and the policies based upon them can be shown to be erroneous, dogmatic, and incompatible with facts, straight thinking, humanity, and even national self-interest. It has already been shown that proof regarding the inborn differences between races or nations is insufficient to justify a classification into inferior and superior. Therefore, any policy which discriminates against one group in favor of another is prejudiced and unjustifiable. It is, moreover, doubtful whether an adequate immigration policy can result from a narrow national outlook. Factors of international concern are involved in the movements of individuals from country to country. The suggestion that travel or the residence of individuals within national boundaries should be restricted by legislative process would evoke general protest; sharp tongues would refer scathingly to times of slavery. But no sooner is the problem shifted to relations between nations than an equally unjustifiable restriction upon the freedom of movement and residence of individuals is advocated. If immigration is to be controlled, it should be by means of international agreements which take into account the interests of all nations involved. Such control should not take the form of legislative enactments. As far as the law is concerned, free immigration should become the watchword.[1]

Current Americanization theory is based on a belief in the desirability of cultural uniformity. This belief is not warranted by history. Cultural diversity, the coming together of different outlooks and traditions, the juxtaposition of different standards, have always fostered greater objectivity, a liberal attitude toward men and things, a toleration of standards and habits other than our own, and greater cultural vitality and creativeness.

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[1] An extra-legal control and direction of immigration is a very different matter. One is tempted to think of an International Bureau of Immigration where all the available information upon agricultural, industrial, and professional conditions in the world would be placed on file. Such a bureau might well indulge in immigration publicity and propaganda, thus directing the flow of immigrant groups to places where they are most needed and occupations in which they are most likely to succeed. (See Chapters XIV and XV, below.)

The influence of our cultural traditions, which for a long time will remain predominantly Anglo-Saxon in their general outlines, will invariably weaken and even totally destroy the cultures of immigrant groups whether we wish it or not; but this process need not be artificially precipitated. The presence of foreign groups with their national customs and ideals provides an unprecedented opportunity for the enrichment of our own National life. Let us leave them alone as much as possible. Let them preserve as much of the old as they choose and for as long as they may. This will not interfere with their wholehearted participation in our culture. On the contrary, the less they are oppressed or subjected to hurried and forceful recasting into Americanism, the faster they feel themselves at home, the better they thrive, culturally as well as economically, and the sooner they contribute to our own cultural growth.

There is still another phase of this problem. The very presence of these cultural groups opens up unusual educational possibilities. Instead of aiming at an insular development in our children's education, after the fashion of the present school system, we should seek to broaden their outlook, enrich their thought, and humanize their emotions, by bringing them into frequent and intimate contact with the habits, ideals, and modes of living of different immigrant groups. Such studies into the history and cultural life of Europe would give a broader insight into international relationships. To-day, Americans are probably the least cultured of world travelers. They are prone to assume a supercilious attitude toward the Parisian because, for example, private baths are less common in Paris than in New York; or to take an equally derisive attitude toward the Italian because he gesticulates in court or whistles in the theater. Children familiar with diverse cultural backgrounds are not likely to exhibit such intellectual provincialism and emotional egocentrism. Needless to say, Americans brought up in such a manner would have a more sympathetic understanding of National problems. Then, and then only, could we justly claim the right to leadership in world affairs.

PART V

POPULATION AND LABOR SUPPLY

CHAPTER XIV

TRAINING AND DIRECTION OF OUR LABOR SUPPLY

By GEORGE SOULE

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Before this subject can be made clear, certain assumptions must be examined. What is commonly meant by 'labor supply'? Not, as a rule, the whole adult population, but merely that part of it which is willing or forced by circumstances to accept the status of wage-worker. 'Supply' also connotes the purchase and sale of labor's productive contribution in a single market, much as if it consisted of standard units of a basic commodity. Associated with this conception is the idea of a 'necessary' surplus of labor, sufficient to meet the peak demands of employers without forcing wages to a disturbingly high level. 'Training' is a rather unusual word to couple with such an inanimate thing as a 'supply,' but this training may be thought of as a sort of conditioning process, expressed in trade education or tutelage in specific operations, so that the available supply may possess full value whenever bought. 'Direction' may mean either the placing of the various parts of the supply where it is required, or the control of the supply, once bought, so that its production may be brought to a maximum.

The ordinary reasons which prompt the discussion of this subject as part of the population problem are fairly obvious. Immigrants have formed one of the main sources of labor supply in the past; how, then, is this supply to be replenished under restricted immigration?

And assuming that we do not admit enough immigrants to equal the demand, how can labor requirements be filled by training the native-born for wage-work — it being granted that the native-born, imbued with current American ideals, tend to make their way out of the labor supply by becoming executives, independent proprietors, professional workers, advertising men, salesmen, clerks, and so on? To the person holding the assumptions first outlined, this task looks difficult; and he therefore turns to the last hope — that, if he fails to get enough immigrants or to shunt enough native-born into the labor supply, he may yet, by careful direction, get enough work out of the available supply to remedy the deficiency.

One of the first comments on the above assumptions and questions is that such an outlook rather naïvely transfers to the whole Nation the conception of labor needs held by the proprietor of an individual plant. He thinks of the laborer solely as a producer, and not at all as a consumer. He is concerned with getting work out of his employees in order to make products which are to be sold elsewhere. But in the Nation as a whole such a concept is, of course, absurd. Changes in the labor supply which involve population changes are not only changes in productive capacity, but also changes in consumptive demand. Population growth or restriction cannot be considered intelligently without looking at both sides of the economic process. Furthermore, the labor supply is not a homogeneous mass of standard units, but a large number of individual persons trained or fitted by nature for differing occupations, and with varying degrees of skill and aptitude.

If we eliminate consideration of the quantity of natural resources and look at changes in the rate of growth of the population solely from the point of view of their effect on the labor supply, such changes ought, under proper control, to be a matter of economic indifference to all concerned. They ought to be so, that is, if the added persons produced no less and no more than they consumed, and were properly distributed among the various necessary occupations. Or, to state the matter more precisely, the rate of addition to the population would not affect the general economic welfare if (1) the distribution of work and income were so ordered that the addition of any given number of persons would have an equal effect on both the demand for and the supply of consumption goods and services and productive capital; and (2) the addition to the population were so distributed as not to disturb an existing balance among the various industries and occupations.

It follows that any worry about the effect of restricted immigration on the labor supply either is unjustified in the long run from the point of view of the whole community, or indicates a situation which in any case would need to be remedied. We are therefore forced to substitute broader assumptions for those usually associated with the training and direction of labor supply, and to seek to interpret the subject in the light of the requirements of a well-balanced and ordered society. The best way to meet any possible shortage of labor is to act as we should to produce the highest degree of social efficiency regardless of such shortage.

Parenthetically, it should be noted that the statistics of migration do not at present indicate that the restrictive laws have caused much real change. The net annual increase of population by the arrival and departure of aliens averaged 581,408 for the seven fiscal years 1908 to 1914 inclusive. The net increase for the fiscal year ending June, 1924, was 630,110, and for that ending June, 1923, it was 472,820. Thus the average for the two years was 551,465, or almost as much as the pre-War average.

For purposes of discussion, however, let us assume that there will be further restrictive legislation, and that the result actually turns out to be a general scarcity, in relation to employers' requirements, of persons willing or forced to accept the status of wage-worker. This scarcity might be expected to exert an influence in the direction of an increase in the remuneration of wage-workers, which would at the same time attract more of the native-born to these occupations, and also render the wage-earners' effective demand on the supply of commodities more nearly equal to their contribution to that supply. It would direct attention to the more efficient use of labor power. In other words, any shortage of labor supply as ordinarily understood would tend to alter those fundamental conditions which alone could cause such a shortage; namely, an unbalanced occupational distribution of the existing population, and unduly great incentives for the entrepreneur.

Instead, therefore, of thinking of the wage-workers as a separate, floating labor supply, which can be dipped into as if it were a market for commodities, it will be more useful to think of wage-workers as an integral part of the whole population, participating in a common task and sharing in a common product. Such participation, if intelligently organized, might provide the means of a change in their economic status, a change in the actual conditions of work so as to make it at once more salutary and more productive, and a change in the ideals of the native-born so that those who were best fitted to do so might not be averse to making manual work their vocation. An adequate development of vocational education, guidance, and placement cannot precede, but might follow, such fundamental developments.

If society is best to use the labor power latent in the population, what must be done? This is a perplexing question, to which science and technique are just beginning to furnish the answers, but it may be useful to draw rough outlines of what seems to be foreshadowed. In the first place, there must be a growing control of the basic conditions underlying the demand for and the allocation of labor. This involves the better use of productive capital. It means the coördination of industries, the elimination of waste incident to unnecessary duplication of plants and variety of products, the elimination of waste in distribution, more substitution of machinery for hand power, especially in the unskilled and unpleasant processes, a moderation of the business cycle, and a social regulation of private monopoly powers wherever they arise. Eventually, we might hope for a planned allocation of the economic surplus so that labor power may continuously be utilized where it will produce the greatest social values.

This is not the place to attempt to elaborate upon such a large program. It may be enlightening, however, to estimate some of the avoidable losses in the use of man-power in the United States. We may pass over as incalculable such immense items as the possible gains from improved machinery and technical processes, and from the standardization of products; the losses preventable by the avoidance of excess productive capacity; and other large forms of waste associated with the material side of industry. We may, however, make estimates, necessarily rough in the extreme, of man-power losses from four causes alone: unemployment, labor turnover, industrial accidents, and ill health.

The United States Commissioner of Labor Statistics, Ethelbert Stewart, is authority for the statement that the fluctuation of employment in manufacturing industries, not including absence due to sickness, industrial accidents, or turnover, is equivalent to a yearly average total of continuous unemployment for between 1.5 million and 1.75 million persons. In coal mining, he tells us that, judged by the capacity of the better mines if worked regularly, there is an excess of about 280 thousand men. It is probable, according to my own guess, that of the time of 930 thousand men employed on railroads in the maintenance of way and equipment, at least one sixth is lost through fluctuations of employment. This is equivalent to the full time of 155 thousand men. In building construction, the conservative estimate of Ernest Bradford is that sixty days per year are lost by the average employee. Since according to the Census there are about 1.8 million building workers, we have here a man loss of 300 thousand on the basis of a 300-day year. The total of the above, without including trade or transportation other than railroads, is 2.2 million. Of course, not all this unemployment can ever be avoided; but we may guess that upwards of 50 per cent of it ultimately may be. Our labor loss through avoidable unemployment may therefore be stated as about 1.2 million men.

The average labor turnover in 34 American factories in 1913–14 was 138 per cent, and of 53 factories in 1917–18, 218 per cent. P. Sargent Florence, who quotes these figures, estimates the minimum practicable turnover as about 26 per cent. Assuming that the average turnover is now enough better than in pre-War days to have fallen to about 100 per cent, we still have left an avoidable turnover of 75 per cent. Mr. Stewart estimates that the average period out of employment due to turnover is two weeks. Applying these figures to the factory employees of the United States, we find a loss equivalent to 315 thousand factory workers constantly idle, not counting the losses in production or overhead expense due to other aspects of turnover, and not counting the turnover in other occupations.

Carl Hookstadt estimated that in the United States 227 million working days per year were lost on account of industrial accidents. Assuming a 300-day year, the loss would be equivalent to 756 thousand persons constantly idle from this cause. If half the accidents are preventable, the avoidable loss is 378 thousand.

A moderate estimate of the average loss of time through ill health is six days a year. Applying this to the number employed in manufacturing, railroads, and mining, we find that the loss, on a 300-day working basis, is equivalent to about 280 thousand persons. If half of it is avoidable, the net loss is 140 thousand.

We therefore have, as a rough but incomplete and low estimate of the avoidable loss of labor-power through these four causes alone:

	Number of Workers[1]
Unemployment	1,200,000
Labor turnover	315,000
Industrial accidents	378,000
Ill health	140,000
Total	2,033,000

It is true that this loss can be eliminated only through gradual progress. Let us give ourselves twenty years for the task, and assume that the loss can be decreased at the rate of 5 per cent of the present total every year. This would mean an annual addition to the labor force of the equivalent of 100 thousand persons, which would roughly equal the falling-off of the net addition to population through migration from the average of the seven fiscal years 1908–14 to that ending June, 1923, and would far more than equal the falling-off in the addition to our adult industrial labor supply.

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[1] These figures are from *The Tragedy of Waste*, 1925; a comprehensive study of economic waste by Stuart Chase, assisted by the staff of The Labor Bureau, Inc.

To add labor power by the method outlined would have the great advantage over immigration that, while it would furnish a yearly increment of producers, it would not of itself add a single consumer to the population. Making the extreme assumption that the average immigrant and his family consume only half as much as he contributes to production, we still should have the general population enjoying a yearly increment to commodities and services greater by the product of over 50 thousand man-power than under a policy of recruiting the same labor supply from immigration. It must be remembered, of course, that such additions to productivity would be of no advantage unless the wage-earners simultaneously received additional purchasing power to absorb the increased product.

Elimination of such wastes requires, in most cases, merely the widespread application of techniques already known and tested. Rapid progress in the efficient ulitization of labor-power is not merely Utopian speculation. As a broad indication of this fact, we may compare the production record of the so-called 'boom' year 1920 with that of the moderately prosperous year 1923. The physical production of basic industries in 1923, according to the index of the Federal Reserve Board, was about 18 per cent above 1920. The population increased less than 5 per cent in this period. Here is an indicated increase in basic production, per capita of the population, amounting to over 10 per cent in the space of three years. Manufacturing production alone, according to the Department of Commerce index, was about 11 per cent larger in 1923 than in 1920. Yet the number of employees in factories, according to the best indexes, did not increase at all between the two years, but on the contrary dropped 2 or 3 per cent. Here is an increase in physical production per worker amounting to about 15 per cent.[1] This alone would be sufficient to explain why no general labor shortage developed after the scanty immigration of 1921 and 1922. The increase is also sufficient to balance the increase in average real earnings which probably occurred through the failure of wages to drop as far as retail prices in 1921–22, and their increase at a slightly more rapid rate than prices in 1923.

It is possible to conceive such a process of increasing production per capita, accompanied by higher real wages and better living conditions, progressing indefinitely and even more rapidly than in the immediate past. But the chances are that it will be interrupted by frequent backslidings and will not produce anything like its full benefits unless we devote an increasing amount of attention to the social aim and to the scientific discovery of methods of attaining it.

Within the limits of any given population and any given quota of natural resources, there is an extremely wide margin between the existing standards of life and those which might be attainable with better methods. If we concentrate on achieving the best utilization of the resources at hand, we need not worry about recruiting the labor supply from abroad. We may safely waive the question of labor supply, and concentrate on the optimum relationship between population and natural resources, and on the sociological and biological questions involved. If restriction of immigration should cause more attention to be paid to the task of bringing about a better economic use of the human capabilities which we have, it would be salutary indeed. But such attention would be equally beneficial, whether immigration is restricted or not.

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[1] There is a margin of error in this conclusion due to the fact that the employment figures are somewhat differently weighted by industries, and may not sufficiently reflect the growth factor. But the increase in productivity can hardly be less than 10 per cent.

CHAPTER XV

RESTRICTIVE IMMIGRATION AND EMPLOYMENT

By BRYCE M. STEWART

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It has seldom been a serious problem in the United States to secure an adequate supply of labor. The South has had the Negro and could afford to be backward in its technical processes. The North has had the immigrant, and he has eased the pressure for more scientific methods in plant and personnel. The falling-off in immigration during the War did force us to spread labor more thinly over a greatly increased production, and it is now contended in some quarters that the inelasticity of our labor supply resulting from restrictive immigration is raising a similar problem. One body of opinion holds that, if there should be any considerable expansion in industrial activity, this would necessitate relaxing the present restrictions. The other welcomes the new policy on the grounds that just as the War labor shortage forced us to curtail our prodigal waste of labor, so the diminution of immigration will promote a wider adoption of labor-saving devices, and result in greater stability in employment and production. According to this view immigration, averaging a million annually, enabled us to staff for the peaks and to have four or five million workers unemployed in the depressions; but an average annual immigration of half a million or less will compel better management of unemployment.[1]

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[1] See William A. Berridge, *Cycles of Unemployment*, 1923. Pollak Publication, Number 4.

In view of the small likelihood of any early change in the immigration policy of the country, we shall first consider what measures have been suggested for stabilizing industry and the labor supply. These may be classified as:

(1) *Governmental*, which includes long-range planning of public works and purchases to compensate for variations in the ordinary demand of the community; organized migration of work-people; adjustment of immigration to the requirements of industry; dovetailing of employments; decasualization schemes; and vocational and technical education.

(2) *Industrial*, which has two subdivisions: (*a*) Coöperative efforts by industries, often as a result of trade-union initiative, to standardize wages, prices, and conditions of employment; the elimination of seasonal unemployment, as in the building trades; industrial schemes of unemployment insurance and employment exchanges. (*b*) The individual efforts of single employers, consisting of planning ahead, manufacturing for stock, developing staple lines, spreading deliveries, making by-products, spreading advertising, adding to plant and making repairs in slack seasons, organizing short time, adjusting prices to seasonal demand, training employees for more than one job, and establishing plant unemployment funds.

(3) *Financial*, which includes various devices proposed for controlling the business cycle, such as the control of bank credit issued to the business community, and the stabilizing of the dollar.

(4) *Informational*, which covers research in the seasonal and cyclical irregularity of industry; study of various experiments in stabilization; construction of statistical indexes of employment, production, distribution, prices,

and so forth; and dissemination of information on all these subjects.

There has been some loss of faith in governmental measures for reducing fluctuations in business. Take, for example, the long-range planning of public works. Despite the wide discussion on the subject in recent years, most government contracts and purchases are released with little regard to the general employment situation. In England, A. L. Bowley and F. D. Stuart say: 'The chief difficulty is in connection with practical administrative detail. The scheme can only be worked with the co-operation of local authorities; but experience shows that the latter are not very willing to take long views and that continuity of policy is likely to be interrupted by the issues raised at local elections.'

Nor is there great confidence in government-administered unemployment insurance. True, in Great Britain the national scheme of unemployment insurance was extended to the whole industrial population in 1920. Government systems of unemployment insurance have also been established in Italy, Austria, Switzerland, Luxembourg, and Poland, and a Dominion-Provincial system of employment offices has been started in Canada. (See Chapter XII.) But many now hold that industry can perform these functions better than government and the principle of insurance by industry has already received considerable recognition in British legislation. The Italian law also makes provision within the State system for special industrial schemes.

In this country, we have the beginnings of a better immigration policy; but the United States Employment Service has been virtually dismantled, and, although the President's Unemployment Commission recommended an increased appropriation, nothing has been done. It is possible that Wisconsin and one or two other States may establish systems of unemployment insurance within the next few years, although some careful students believe that such legislation would be declared unconstitutional. Scarcely any one dreams of the establishment of a National system of unemployment insurance in this country within the lives of the present generation.

As against this, we have a few important industrial beginnings. The Amalgamated Clothing Workers have an unemployment insurance plan under way in Chicago and another agreed upon in New York. In the ladies' cloak and suit, the cloth hat and cap, and the fur industries schemes are in operation or agreed upon, and several unemployment funds are operated by individual establishments. But management in a particular industry gives little attention to the problem of stabilizing production in the industry as a whole. The individual firms compete; they do not coöperate. One establishment is producing at capacity while a neighboring concern is on short time. One center of the industry is building new factories while another has much idle plant.

Governments may stimulate industrial initiative, as in the case of the recent conferences on winter employment in the building industry in the United States and Canada. Here ground is being gained. Thomas S. Holden, statistician for the F. W. Dodge Corporation, says that the unprecedented winter revival in the building industries in 1923–24 probably established a precedent for winter building that alters permanently the normal distribution of building activity through the year.

With regard to the stabilization of the individual plant, 'the applied technique of stabilization,' as Henry Dennison calls it, some employers are marking time after their experiences in the recent dull period, and in many lines firms have discontinued manufacturing for stock after having been caught with heavy inventories and having to deal with hand-to-mouth buying. Many of those who still try to follow this policy make analyses of last season's sales, but do not actually begin manufacturing until some orders for the new season arrive with which to check up the analysis.

The experience of some of the clothing firms that have tried to regularize employment by developing staple lines is noteworthy. They concentrate on these lines, but the consumer does not cease to demand special models. The result is that the business goes to firms that produce these models, and the workers follow if they can, and continue to be seasonally unemployed. The volume of business in special lines and the consequent irregularity in the industry is as great as before, but it is concentrated upon a smaller number of firms. The consumer is a determining factor and his education proceeds slowly.

Financial devices for reducing the major fluctuations in business have probably received more attention in recent years than either governmental or industrial schemes, and regulation of the volume of bank credit is proposed by some writers as the most powerful agency for stabilizing industry. Here the informational phase of the movement for stabilization comes to the fore, since obviously, if credit is to be issued in accordance with index numbers, we must broaden the scope of our statistical information and improve our methods, and in particular we must obtain better information on employment and unemployment. One of the chief defects in our employment statistics has been the use, as an index of the volume of employment, of the number of employees on payroll, regardless of the hours worked. Such an index may show full-time employment when the factories are working only half-time, if the industry, instead of releasing workers, rations employment. The figure of wages earned is not open to this objection, but wage rates fluctuate, and the only strictly accurate index is the man-hours worked. While it may seem a dream to think of obtaining this figure for any large number of establishments, it is now available weekly for the three hundred and fifty firms of the men's clothing industry in Chicago. For the purposes of the unemployment insurance scheme every firm in the market sends to the office of the trustees a weekly statement showing for each worker on payroll the hours, earnings, and insurance contribution. These data are posted on individual records and the totals for each shop are obtained automatically. In this industry, therefore, there is no necessity for using the number of employees on payroll or any other makeshift. Perhaps as American industry underwrites its responsibility for irregular employment by the establishment of unemployment funds, important statistical information will become available.[1]

Briefly, then, we find a shift of emphasis from governmental to industrial methods of stabilization. Industry offers some promising experiments, but recent experiences in stabilizing the individual plant make us pause. The management of any single establishment works in a limited sphere, while the unemployment problem of an industry demands the coöperative effort of all employers. There is a growing body of opinion that we must have some powerful agency that will act as a brake on the forces that make for fluctuation, and regulation of the volume of bank credit is being proposed as the best instrument for the purpose; but this calls for more and better information, as evidenced by the conflicting advice issued for the guidance of business by the various forecasting agencies. We must remember, too, that there will be a lag between the discovery of the proper economic medicine and its use by the world of business. The widespread unemployment of recent years does not indicate better control of this greatest of industrial evils and one may conjecture that stabilization will proceed slowly, even under the urge of a shortage of labor.

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[1] See Paul H. Douglas, *Real Wages in the United States*, 1926. Pollak Publication, Number 9.

In any case, the argument that a restricted immigration policy will promote better management of employment is largely academic. The Commissioner-General of Immigration says that the restrictions imposed by the Act of 1917 'resulted in widespread evasions of the law, which our limited border forces have not been able to prevent. The per-centum limit law of 1921, however, has proved to be an even more prolific promoter of smuggling and border-running in general, for this method of getting into the United States has been resorted to by great numbers of determined Europeans who failed to find, or were delayed in finding, places under the quotas.' The Secretary of Labor is much concerned over the 'scandalous bootlegging' of aliens through American seaports and across the southern and northern international borders. The incentive to stabilization is therefore practically non-existent. Since immigration is, after all, a question of labor demand, supply, and distribution, we must establish machinery that will register that demand and supply, indicate the need of immigrants, and provide for their recruiting and distribution. Even those who are convinced that immigration restriction makes for industrial stabilization must first find a method of enforcing a restriction policy. (See Chapter XI.)

One fundamental consideration has received but scant attention; namely, that in quantity immigration should approximate the unsatisfied demand for labor and, occupationally, it should be readily absorbed in that demand. The Secretary of Labor seems to favor adjusting the flow of immigration to the requirements of industry. The Secretary would admit immigrants when labor of like kind could not be found unemployed in the United States, and he would have the President authorized to prohibit or further limit immigration whenever the Secretary of Labor and the Secretary of Commerce should so recommend. This means selection abroad and implies formal arrangements between the countries concerned.

The General Conference of the International Labor Organization of the League of Nations, convened at Washington in 1919, recommended to the members of the organization that 'the recruiting of bodies of workers in one country with a view to their employment in another country should be permitted only by mutual agreement between the countries concerned and after consultation with employers and workers in each country in the industries concerned.' Adoption of this recommendation would involve the presentation of data on the need for labor in the country of demand and its availability in the country of supply, and the establishment of facilities for recruiting, selecting, and distributing workers. The conference took this into account by adopting a resolution calling upon each nation ratifying the convention to establish a system of free public employment agencies under control of a central authority, with advisory committees of employers and workers. An experiment in this direction was undertaken by the Employment Exchanges of Great Britain and Canada shortly after the War. Requisitions of Canadian employers which could not be filled by the Employment Service of Canada were forwarded to the British Employment Exchanges, which undertook the task of recruiting the required workers in Great Britain and of dispatching them to Canada in cooperation with the Canadian Immigration Service. The Employment Exchanges of the two countries were linked together in a kind of international employment exchange. (See Chapter XII.)

It should be possible to apply such a procedure to all immigrants who must obtain employment soon after arrival. In the United States this would involve the promotion of an adequate National employment service, a step recommended by President Harding's Unemployment Conference and by almost every other public body that has studied the subject in recent years. Indeed, a decade or more ago the Immigration Service tried to set up with its own personnel a kind of labor exchange for the better distribution of immigrants. A Federal-State-City employment service could be organized with the present State employment offices as a nucleus. The Nation would then be in possession of the facts concerning the demand for and the supply of labor and the need of immigration. If an unsatisfied demand should exist at any employment office, the signed applications of employers asking for admission of workers would be forwarded to Washington. Here the National officials of the Employment Service would scan the reports of employment exchanges in foreign countries, showing the numbers and occupations of workers registered with them for employment in the United States. They would then requisition the workers needed from the countries with suitable applicants. The foreign exchanges would certify to the occupational qualifications of the workers selected and would present them to the American consul.

Some of the European countries from which our immigration is derived have employment exchanges sufficiently well organized to function in this way. Countries not so equipped would soon provide the necessary facilities, especially those endeavoring to promote emigration. If the consul approved the selection, he would require the workers to sign a contract to remain in the accepted employment for a reasonable time. They would be given a written advice to the employer, a copy of which would be dispatched to the official of the employment service nearest the prospective job. The local employment office and its advisory committee would be required to assist the workers and the employers in establishing their new relationship and to see that both parties observed the terms of contract.

Such a procedure would mean a complete reversal of our policy on contract labor, since all immigrant workers would be admitted under contract. But why not? The present law was directed against unfair contracts. Legitimate agreements, completed and carried out under the supervision of public officials, would obviate the abuses which the Contract Labor Law sought to abolish. Organized labor would have less to fear from aliens admitted to assured employment, if no workers were available in the country, than from those thrown upon the labor market by the present promiscuous methods. Labor would profit from the policy of advising employers whose requisitions remained unfilled in what countries qualified persons could be secured.

With a definite job awaiting the newcomer, there would be less need for leaving wives and children behind, a factor that now complicates our immigration problem. One of the principles of the Commissioner-General of Immigration, 'to count the quota overseas' and so avoid deportations, would be met through the plan of selection by the foreign exchanges and certification by the American consul. The volume of illegal immigration should be reduced. Workers abroad emigrate to the United States to obtain jobs, and once they were aware that the employment offices in their own home districts could advise them when and where and on what terms employment in their occupations could be had in this country, they would tend to patronize them. Until some such plan is adopted, any estimate of restrictive immigration as a force for stabilizing industry can be little more than conjecture.

CHAPTER XVI

EFFECT OF THE EMPLOYMENT OF WOMEN ON POPULATION

By BESSIE BUNZEL and ROBERT VANE, Jr.
Of The Metropolitan Life Insurance Company

Every time during the past ten years, and especially during the War, that women entered new and unusual fields of work, such widespread publicity followed that many misconceptions arose concerning the occupational status of women. There was no end of uninformed talk about the extent to which women were entering industry and how this would affect population — dire predictions and glowing prophecies alternated with one another. It was believed that women were becoming a very real force in industry, that they were taking the place of men on a large scale, and that great numbers were, for the first time, finding occupation outside the home. The Fourteenth Census of the United States put an end to this discussion by showing how the employment of women had shifted during the years 1910–20. The decade showed an absolute increase in numbers of about 500 thousand working women. Omitting agricultural pursuits because of probable inaccuracies in the figures, the proportionate number of all women ten years of age and over gainfully employed increased only very slightly. But if there was no great relative increase during the decade, the Census showed the considerable total of over 8.5 million women gainfully employed.

In addition to the Census material we have several careful studies on special phases of the question which may, perhaps, throw light upon the relationship the employment of women bears to population growth, as reflected in marriage-rates, the age at marriage, fecundity of marriage, and the effective fertility of marriage. Though a few students have endeavored to analyze quantitatively as accurately as possible these sociological factors, our knowledge is fragmentary and the gaps in our data are many. The best that we can hope to accomplish here is to point out the existing material and the additional investigations which must be undertaken before any final conclusions can be reached.

How does the gainful employment of women influence the rate of marriage? One factor tending to prevent marriage is the increasing economic independence of women. A woman who is able to earn her own living is more critical in her choice of a husband and does not seize the first opportunity to marry as a means of escape from a distasteful economic position. Furthermore, she may be unwilling to give up a well-paying job and live within the income which the average young man can provide. In Massachusetts, as in England, the marriage-rate is generally found to be lower in districts where much female labor is employed. Whether the increasing employment of women is a cause of the lower rate of marriage and of postponed marriage, or whether women enter industry because their opportunity for early marriage has become smaller in recent years, is an open question. Theresa MacMahon[1] says that the increased independence of women results from, rather than causes, the postponement of marriage on the part of men. In other words, women go into gainful occupations at the present time because they marry later than they formerly did, and therefore it is necessary for them to fill in, with some kind of work, the period between leaving school and the date of marriage. She admits, however, that once women become established in business or industry, they are loath to give up the luxuries and opportunities which their work affords.

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[1] Theresa Schmid MacMahon, *Women and Economic Evolution*, 1912; pp. 77–78.

Another influence which tends to delay the age of marriage is the high proportion of women to men. C. T. Brunner [1] has recently suggested that later marriage results from a preponderance of women — the ratio of men to women being determined by the industrial character of a district. Where the main industries call for men's labor, like mining and shipbuilding, the proportion of males to females is high, the marriage age of the women is low, and the birth-rate is high; where the demand for female labor is strong, there is a low proportion of men to women, a high marriage age for women, and a low birth-rate. After comparing, for the counties of England and Wales, the ratio of the sexes in 1901, the marriages per thousand (1901–10) in which females were under twenty-one, and the births per thousand living in 1901, he concludes as follows: 'The variations of the birth-rates of different parts of the country seem to depend on the industrial character of the districts; the industrial character of the district determines the sex-distribution of the population, especially at the important period between twenty and thirty. The sex-distribution of the population determines the age at which the women marry through the keenness or otherwise of the competition for them, and the age of marriage of the women determines the birth-rate.'

William F. Ogburn,[2] after analyzing the statistics of

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[1] C. T. Brunner, 'Local Variations in the Birth-Rate,' *The Economic Journal*, March, 1925; pp. 60–65.

[2] William F. Ogburn, 'Factors Affecting the Marital Condition of the Population,' *Publications of the American Sociological Society*, 1924; vol. XVIII, pp. 47–59.

170 American cities, arrived at similar conclusions regarding the sex ratio and the rate of marriage. He found that manufacturing cities show a higher proportion of married persons than cities supported almost exclusively by trade, since there is a larger ratio of men in manufacturing cities. Furthermore, by discounting to a large extent the migration of women, he showed what the effect of the employment of women would be, apart from this cause, on the marriage ratio. After making these corrections, he still found a lower proportion of married persons in districts where large numbers of women were employed; and likewise a slight delay in the marriages of women.

To these findings the latest Census figures offer a seeming contradiction. Contrary to the general belief, the figures for 1920 show an increase in the percentage of persons married at virtually all ages, as compared with 1890; and, stranger still, the percentage increase is greatest in the ages 15 to 19 and 20 to 24. This increase in the proportion of marriages among young people is running concurrently with an increase in the proportion of women in gainful occupations. To determine the significance of this finding requires intensive study. One important factor bearing on the question is the large increase of married women in industry between the two Census years. In 1890, of the women 15 years of age and over engaged in gainful occupations, 13.9 per cent were married, as contrasted with 23 per cent in 1920. The number of married women in industry increased 272.7 per cent from 1890 to 1920, whereas the total number of women employed increased only 124.8 per cent. Since it is no longer considered a social stigma for a married woman to retain her job, perhaps earlier marriages result from the new economic partnership. Although significant, this is far from a complete explanation. Many factors will have to be correlated before its true implications can be known.

The importance of a lower marriage-rate because of the gainful employment of women is obvious. Their age at marriage is also significant. J. C. Dunlop[1] has found that 'the effect of one year's delay of marriage is to reduce the average family by fully one third of a child, or that three years' delay may be expected to result in the family being one child less. This result may be fairly correct in general, but it cannot be strictly applied, for the crude observations show that the effect of one year's delay is not constant through the fertile period of the woman's life, but is greater for the younger and less for the older ages. Thus, a year's delay when the woman is aged from 20 to 25 averages 0.45 of a child; 0.37 when she is aged from 25 to 30; 0.32 when she is aged from 30 to 35; 0.29 when she is aged from 35 to 40; and 0.19 when she is aged from 40 to 45.'

In addition to reducing the rate of marriage and postponing the age of marriage, there is evidence that the increasing employment of *married women* lowers the birth-rate. No American data show the fecundity of different groups of mothers classified according to occupation; but the thorough British *Report on the Fertility of Marriage* gives full data[2] on the fertility of wives of less than forty-five years of age in specified gainful occupations; children born and children surviving per hundred couples; also the ratios of these numbers to the corresponding figures for the whole population taken as 100. Throughout the table low fertility is almost universal, brushmakers and costermongers alone showing a standardized rate as high as that of the general population. The ratios for children born varied from 43 per cent for actresses to 102 per cent for costermongers. The following numerically important occupations showed unusually low percentages: actresses, 43; artistic and scientific pursuits, 51; teachers, 52; domestic servants, 52; musicians, 54; clerks, 55; local government officials, 60; milliners, 63; barmaids, 63; and tobacconists, 65. Important textile industries employing large numbers of women showed ratios of from 59 to 75 per cent. The exceptions were lace manufacturers, 98 per cent; manufacturers of canvas, 96 per cent; and cotton spinners, 82 per cent.

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[1] James C. Dunlop, 'The Fertility of Marriage in Scotland: A Census Study,' *Journal of the Royal Statistical Society*, February, 1914; p. 266.

[2] *Report on the Fertility of Marriage*, vol. XIII of the 1911 Census of England and Wales, 1923; p. cxiii. We have retained, in the above discussion, the English headings exactly as they are given in the table, in spite of the fact that they differ from American usage. This one table includes both professional and industrial workers, even though the problem is quite different in these classes.

As a digression, we may note how the employment of children may affect the birth-rate. It has been said that the Industrial Revolution, by utilizing the labor of young children, made the possession of a large family profitable to the parents; but, because of factory legislation which controls the conditions under which they may work, children no longer contribute to the family prosperity, but are instead a heavy drain upon it. As a direct consequence, it is said, there has been a marked reduction in the size of working-class families. After painstaking studies, Karl Pearson believes there is much truth in this observation and points out that legislation intended to increase racial fitness may end by penalizing parenthood. He explains the unusually low birth-rate in Bradford, a textile manufacturing town, as 'due to the decreased economic value of the child which had followed the extensive factory legislation with regard to its employment. Formerly, a child became at an early age a pecuniary asset. It contributed to the family maintenance by six or eight years of age, and by the number of children the economic prosperity of the home was in a certain sense measured.'[1] In his *Study of the Data Provided by a Baby Clinic in a Large Manufacturing Town*, Pearson shows that wages do not advance nor does the home increase in size proportionately with the coming of more children, until these children begin, by their own labor, to add to the family income. Crowding ceases as successive children reach the earning stage; and the help of its working children then increases the well-being of the entire family. If through legislation, therefore, the age of compulsory school attendance is lengthened, and children are prohibited from entering industrial employment until they reach an age when they will soon establish homes of their own, they will not be economically profitable to their parents.

But it is largely the growing emancipation of woman, her wider industrial, commercial, and professional activities, and her demand for greater leisure and for freedom from the physical and mental burdens of an over-large family, that determine the number of children to which she voluntarily gives birth. Undoubtedly, many other factors, interacting upon one another, together account for the lowered birth-rate. They can best be concisely summed up in the phrase 'changed standard of living.' The last thirty years have seen a steady rise in the cost of living and in the price of the bare necessities of life. There has been a substantial increase in the wealth of the country; but this has not kept pace with the increased desire for greater comforts and more luxuries. Each family wishes to rise in the social scale; and many parents believe that only through rigidly limiting the size of their families can they give its individual members the education and the vocational training now demanded, and other opportunities for advancement.

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[1] Karl Pearson, 'The Problem of Practical Eugenics,' *Eugenics Laboratory Series*, v, 1912; p. 9.

Moreover, at the very time when these influences were curtailing the size of the family, information concerning contraceptive practices became widely disseminated. William Beveridge observes that the fall in European fertility since 1881 must have been volitional, as it was impossible to connect this decline with any change of economic conditions. It is common knowledge, moreover, that in the so-called 'upper strata' classes, the birth-rate has fallen the lowest; and in these classes the child has never been considered an economic asset.

Returning now to the question of the employment of women, we may note that this may also affect population through its adverse influence on health and longevity. The fact that industry does injure workers is shown by statistics. Louis I. Dublin has pointed out that the expectation of life of men at age 20 employed in industrial pursuits is now 42 years as compared with an expectation of 50 years for those not so engaged. The mortality of men in different occupations varies considerably. Certain industrial processes are associated with high mortality rates for specified causes of death, as, for example, the high tuberculosis death-rate among granite-cutters and steel-grinders. Obviously, mortality is here directly influenced by occupation. Moreover, the mortality of men at the main working ages of life is heavier than that of women, a result undoubtedly due to the wider employment of men than of women. Reasoning from analogy, we may expect the mortality of working-women to be heavier than that of women in general. In a study of preventable disease in the cotton manufacturing industry, where specific hazards are involved, Arthur Perry[1] has shown strikingly the effect of faulty industrial environment on the health of women workers. The corrected death-rate for all causes among female operatives 15 to 44 years of age was higher than that of non-operatives, the mortality of both native- and foreign-born operatives being greater than that of non-operatives. The death-rates from tuberculosis, which were much higher for operatives than non-operatives, account for a considerable portion of this difference. The rise during the War in the death-rate from tuberculosis among women in industrial centers in England where important munition works were located, was definitely associated with the entry of large numbers of women into such employment.

Beyond the general hazards common to both sexes, there are certain industrial processes which are especially harmful to women. Some authorities claim that industrial poisons affect women more rapidly and more severely than men; that lead poisoning, for example, takes a more acute form and occurs after shorter exposure; others think the data do not warrant such a decisive statement. Alice Hamilton summarizes the conflicting arguments.[2] We think the weight of evidence, as regards some poisons, at least, tends to the conclusion that women are more susceptible than men. Whether or not this is true, there is no doubt that lead reacts harmfully on the reproductive functions of women and may cause permanent sterility, miscarriages, premature deliveries, stillbirths, or neo-natal mortality. In addition, a mother suffering from lead poisoning may transmit it to her children. Collis and Greenwood, who do not concede that women fall victims to lead poisoning more readily than men, nevertheless 'hold that the effect of plumbism in causing miscarriage and stillbirth is a sufficient reason for excluding females from exposure to lead dust.'[1]

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[1] Arthur Reed Perry, *Preventable Death in Cotton Manufacturing Industry*, United States Bureau of Labor Statistics, Bulletin 251, Washington, 1919.

[2] Alice Hamilton, *Industrial Poisons in the United States*, 1925.

Other injurious conditions are faulty position and the constant standing or sitting required by some occupations. Harry E. Mock found that menstruation may be interfered with by constant sitting, and he reduced absenteeism from dysmenorrhea fifty per cent in certain departments of one plant by arranging work so that women could alternately stand and sit. Work involving heavy muscular strain, lifting excessive weights, and operating certain types of foot-presses is injurious to all women, especially pregnant women. The effect of fatigue from long hours of work cannot be quantitatively stated, but beyond question an over-long working day seriously saps the vitality of women. As women enter novel occupations, new hazards arise. There is ground for believing that X-ray work, for example, may cause permanent sterility.

In addition to the effect of occupation upon the health of the individual woman, we must consider how it affects the health of the race, as reflected in the ability of the employed woman to bear children and in the amount of infant mortality which can be traced to the occupation of the mother. All students of the subject are agreed that, to a very large extent, the employment of the mother results from the low income of the father, but that this employment influences only indirectly the mortality of the child. As the income of the fathers increases, the percentage of the women gainfully employed during pregnancy and immediately following childbirth rapidly decreases. The employment of the mother undoubtedly reacts unfavorably upon the baby; but so do other accompanying evils of poverty — housing congestion, unsanitary surroundings, and bad nutrition — and it is very difficult to disentangle their effects. The interesting question arises, therefore, as to whether the employment of women does not in a measure counterbalance increased infant mortality by so adding to the family income as to offset the disadvantage resulting from their absence from the home.

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[1] Edgar L. Collis and Major Greenwood, *The Health of the Industrial Worker*, 1921; p. 233

The available data on the subject point to the conclusion that the employment of the mother decidedly increases infant mortality. If the mother's work takes her away from the home, she is unable to nurse her child; and breast-feeding is one of the most decisive factors in the survival of the infant, certainly during the critical first few months of life. George Reid,[1] in a study made in six pottery towns in Staffordshire, England, to determine the effect of home conditions and especially the influence of factory employment of mothers upon infant mortality, found that the deaths under one year per thousand births, where the mothers worked away from home, was 209, as compared with 146 where the mothers remained at home. He attributes this excess of 43 per cent almost entirely to the factor of artificial feeding. J. C. Dunlop, in comparing 5458 records of working mothers with the same number of records of unoccupied mothers, found that 24.0 per cent of the children of occupied mothers, and only 14.8 per cent of the children of unoccupied mothers, were reported to be dead.

The best American studies on the relationship between economic factors and infant mortality in the United States are the series of reports issued by the Children's Bureau. These bulletins show the various factors that contribute to infant mortality in eight industrial cities — Johnstown, New Bedford, Manchester, Akron, Waterbury, Saginaw, Brockton, and Baltimore.[1] In every case, except Brockton, the mortality of babies whose mothers were gainfully employed during the year preceding the baby's birth exceeded that of infants whose mothers were not so employed. This was true whether the mothers were employed at home or outside the home. Except in Akron, the death-rate of babies whose mothers were employed at home was lower than that of babies whose mothers were employed away from home. The following table sums up the data:

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[1] George Reid, 'Infant Mortality in Relation to Factory Labor,' *Fifteenth International Congress of Hygiene and Demography*, 1913; vol. III, part 2, p. 943.

MORTALITY RATES OF INFANTS AS AFFECTED BY EMPLOYMENT OR NON-EMPLOYMENT OF MOTHER IN THE YEAR PRECEDING BIRTH

LOCATION	MOTHER NOT EMPLOYED	MOTHER EMPLOYED	
		At Home	Away from Home
Johnstown, Pennsylvania	117.6	188.0[1]	—[2]
New Bedford, Massachusetts	108.0	121.8	167.8
Manchester, New Hampshire	133.9	149.8	227.5
Waterbury, Connecticut	110.5	131.0	209.2
Saginaw, Michigan	78.3	94.6	—[2]
Brockton, Massachusetts	100.4	84.4	86.7
Akron, Ohio	77.2	114.5	88.2
Baltimore, Maryland	93.4	94.5	179.8

[1] Does not specify whether mother was gainfully employed during pregnancy or after childbirth.
[2] Base too small to calculate rate.

Louis I. Dublin,[2] in a study of infant mortality in Fall

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[1] Children's Bureau, United States Department of Labor, Bulletins 9, 20, 29, 37, 52, 68, 72, 119.

[2] Louis I. Dublin, *Infant Mortality in Fall River, Massachusetts*, 1915.

River, found that the infants whose mothers were gainfully employed, chiefly in the textile mills, showed a much higher death-rate than those whose mothers were engaged in housework only; the death-rate per thousand births was 160.5 for housewives, as compared with 303.6 for those gainfully employed.

Although the effect upon infant mortality of the employment of the mother during the year following the birth of the child is not so evident, the Children's Bureau found that in most cases a smaller number of mothers were employed after the birth of the child than before, and that many mothers did not go back to work until after the death of the child. The death-rate in Saginaw for infants, whose mothers were not employed during the year following the baby's birth, was 74.6, as compared with 154.5 for those gainfully employed; and in Brockton, the rates were 93.5 and 109.7.

The latest and probably the best study on the subject, the British *Report on the Fertility of Marriage*, shows quantitatively the evil results of maternal employment and brings out strikingly the fact that high child mortality characterizes the great majority of women's occupations. This *Report* shows that in those social classes where the mother can obtain a reasonably adequate substitute, the children suffer comparatively little, as in the case of post-office officials, teachers, actresses, clerks, and shopkeepers. Even in these favored classes there is excessive infant mortality whenever the mother is employed. In the more distinctly working-class occupations, on the other hand, the loss of the mother's care frequently involves the death of the child, as in the case of printers, earthenware workers, leather-goods workers, and textile workers. This study gives the child mortality during the first fifteen years of marriage in the families of mothers following specialized occupations, as contrasted with that of non-employed mothers of the same social class as determined by the occupation of the father. Whether work is carried on in the home or outside, the child mortality where the mother is employed exceeds that of the unemployed mother in the same social class, as measured by the occupation of the father. But in the case of women employed at home, the percentage of excess amounts to an average of 21 per cent, ranging from 4 per cent for butchers to 38 per cent for 'dealers in dress.' For the group employed outside the home, the excess averages 49 per cent, and ranges all the way from 4 per cent for actors to 85 per cent for tobacco manufacturers.

We have indicated various ways in which the employment of women tends to influence birth-rates. The subject is important because of the large numbers now gainfully employed and the steady growth in numbers. In 1880, there were 2.5 million; by 1900, the number had more than doubled; and in 1920, there were over 8.5 million, of whom almost 2 million were married. Each Census from 1880 to 1910 showed an increase in the proportion gainfully employed. The decrease between 1910 and 1920, according to the Census authorities, was undoubtedly due to an over-enumeration in 1910 and an under-enumeration in 1920. Correcting for these two factors, it is probably true that the increase has been continuous and that this increase has been especially pronounced among married women. Nine per cent of all married women, 15 years of age and over, were gainfully employed in 1920, as against 4.6 per cent in 1890.

The occupational distribution of employed women is pertinent to our discussion. In the accompanying table on page 249 we have given, for each occupation employing 50 thousand or more women in 1920, the number and per cent of all women and of married women, and the per cent increase or decrease in 1920, as against 1910. This table includes 86 per cent of all women gainfully employed in 1920.

It would be highly desirable for us to show death-rates for women in specific occupations, but unfortunately such data are almost non-existent and little can be inferred from the Census reports. In only a few instances do we know anything about the effect of specific occupations upon the mortality of women. Several investigators have found a high incidence of tuberculosis in cotton mills, and cigar and clothing factories which employ large numbers of women. The table shows that few women are exposed to industrial poisons, and likewise only a small number are exposed to a fatal accident hazard. We have therefore made no further attempt to discuss the subject of occupational mortality. On the other hand, we have compared for fertility of marriage and for child mortality the different headings listed in our table with Table XLIX of the British *Report*. Unfortunately, differences in occupational terminology and in the classification of occupations cut down the number of comparisons which we can make with even a fair degree of accuracy. Furthermore, we have no American Census data showing the age of marriage and the duration of marriage, for which the British *Report* makes allowance. In spite of these drawbacks, the comparisons we can make are significant and indicate a few important tendencies concerning the employment of married women. Selecting those occupations for which we have fairly comparable data, we find that 30 per cent of all married women in occupations employing more than 50 thousand in 1920 have, according to the British *Report*, an unusually low birth-rate — one under 75 per cent of the average. Forty-one per cent

Number of Gainfully Employed Women and Number Married in Each Broad Industrial Class and in Occupations Employing 50,000 or More in 1920 with per cent Increase or Decrease over 1910

(Compiled from United States Census, 1920, Vol. IV)

Industry and Occupation	Number Gainfully Employed 1920		Per cent of Total 1920		Per cent Inc. or Dec. 1920 over 1910
	All Women Ages 10 and over	Married Women Ages 15 and over	All Women Ages 10 and over	Married Women Ages 15 and over	Married Women Ages 15 and over
All occupations	8,549,511	1,920,281	100.0	100.0	+ 1.6
Agriculture, forestry	1,084,128	371,537	12.7	19.3	[1]− 46.4
Farming, general farms	247,253	39,093	2.9	2.0	
Farm laborers	788,611	318,581	9.2	16.6	[1]− 49.7
Extraction of minerals	2,864	1,278	.0	.1	+244.5
Manufacturing	1,930,341	466,663	22.6	24.3	+ 41.0
Skilled workers					
Dressmakers (not in factory)	235,519	66,094	2.8	3.4	[1]− 46.1
Milliners	69,598	12,735	.8	.7	[1]− 32.2
Semi-skilled operatives					
Cigars and tobacco	83,960	29,382	1.0	1.5	
Clothing industries	265,643	52,906	3.1	2.8	+ 75.8
Food industries	72,402	16,746	.8	.9	
Iron and steel	57,819	13,188	.7	.7	
Shoe factories	73,412	18,907	.9	1.0	+ 97.4
Cotton mills	149,185	51,570	1.7	2.7	
Knitting mills	80,682	15,297	.9	.8	
Silk mills	72,768	11,416	.9	.6	
Woolen and worsted mills	61,715	19,567	.7	1.0	
Transportation	213,054	26,480	2.5	1.4	+207.8
Telephone operators	178,379	17,225	2.1	.9	+295.6
Trade	667,792	156,490	7.8	8.1	+ 88.3
Clerks in stores	170,397	28,486	2.0	1.5	+147.0
Retail dealers	78,980	34,801	.9	1.8	+ 17.0
Saleswomen (stores)	356,321	74,856	4.2	3.9	+133.9
Public Service	21,794	7,542	.3	.4	+ 72.3
Professional service	1,016,498	123,578	11.9	6.4	+ 62.0
Musicians	72,678	17,830	.9	.9	+ 4.3
Teachers	635,207	62,153	7.4	3.2	+103.6
Trained nurses	143,664	10,706	1.7	.6	+ 97.8
Domestic service	2,186,924	637,675	25.6	33.2	[1]− 3.6
Boarding and lodging	114,740	42,431	1.3	2.2	[1]− 28.2
Housekeepers	204,350	36,688	2.4	1.9	+ 15.1
Laundresses	385,874	187,510	4.5	9.8	− 28.9
Laundry operatives	80,747	26,237	.9	1.4	+ 59.1
Nurses (not trained)	132,658	24,857	1.6	1.3	+ 23.9
Servants	1,012,133	228,270	11.8	11.9	+ 8.7
Waitresses	116,921	31,037	1.4	1.6	+132.5
Clerical occupations	1,426,116	129,038	16.7	6.7	+290.1
Bookkeepers and cashiers	345,746	39,399	4.0	2.1	
Clerks (except in store)	472,163	46,265	5.5	2.4	+441.0
Stenographers and typists	564,744	37,095	6.6	1.9	+319.9

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[1] Changes in the date of taking the two censuses probably accounts for some of this large decrease.

in such occupations have an excessively high child mortality-rate — 75 per cent above the average.

In the 1920 Census, of the occupations shown in the table the largest group is that designated 'domestic service.' This comprises over 33 per cent of all married women. More than one third of the women in this group are servants. The British *Report* shows that, for the heading 'domestic servants,' the number of children born was only 52 per cent of the average for all women, and the child mortality-rate was 135 per cent above the average. The British *Report* shows a high fertility-rate for the next largest group, laundry workers, 94 per cent of the average, and an excessive child mortality-rate of 116 per cent.

The manufacturing and mechanical industries are particularly important because they show a substantial increase in the number of married women employed between the two Census years of 1910 and 1920. Whereas the total number of women in that class increased only 6 per cent, the increase in the married women amounted to 41 per cent. Over 24 per cent of all married workers are in this group. Those British manufacturing occupations for which we have data show high child mortality-rates, the lowest being 73 per cent excess for milliners, and the highest, 192 per cent excess for cotton-mill employees. The fertility-rates are fairly high for the cigar and tobacco, food, and shoe industries, being over 80 per cent of the average, but are quite low for other workers in this class, especially textile workers. The rate for woolen-mill employees is only 66 per cent of the average.

Agricultural workers account for 19 per cent of the married women gainfully employed in 1920. We hesitate to draw final conclusions regarding the trend of employment in this occupational class, as the 1920 and the 1910 Censuses were taken at different seasons of the year.

Even though the decline in the married women was actually considerably less than the 46 per cent shown in the table, there has undoubtedly been a real decrease in the number employed in agricultural pursuits, since our population is rapidly becoming urbanized. According to the British *Report*, married agricultural workers showed relatively high birth-rates and relatively low child mortality-rates as compared with the average for all women, the fertility figures being 83 per cent for farmers and 92 per cent for farm laborers, and the child mortality-rates showing an excess of 31 per cent and 69 per cent respectively.

Trade occupations employed 8 per cent of all married women in 1920, most of the women in this group being retail dealers or saleswomen. The increase between 1910 and 1920 in the number of married women employed in this occupation was 88 per cent, a substantial growth. The British title most nearly corresponding to ours is 'shop-keepers and shop assistants.' Their fertility-rate was fairly high — 80 per cent; but the child mortality-rate was excessive — 75 per cent above average. The clerical occupations showed the most phenomenal advance during the decade between 1910 and 1920, amounting to 140 per cent for all women, as compared with 290 per cent for married women. Approximately 7 per cent of all gainfully employed married women are in this class. In the British *Report*, the clerical occupations showed very low birth-rates and also relatively low child mortality-rates, being only 55 per cent of the average and 42 per cent above the average, respectively. As a class, professional workers showed a very low fertility. Actresses, whose birth-rate was 43 per cent, were the only group to fall to less than 50 per cent of the average for all women; teachers, musicians, and artists were not far behind, with birth-rates of 52, 54, and 51, respectively. On the other hand, teachers had the lowest child mortality-rate, exceeding the average by only 19 per cent. This group, which accounts for 6 per cent of all married women, increased 62 per cent in the period under discussion.

We are not commenting on the fertility and child mortality in the transportation industry, as the British *Report* contains no heading 'telephone operators.' This is unfortunate, since in the United States the married workers classified under 'transportation' increased over 200 per cent, and married telephone operators — the largest factor in the group — increased almost 300 per cent. Women employed in the 'extraction of minerals' are likewise omitted, since this occupation employs too few women to be significant.

In this country, as we have seen, women play important rôles in the manufacturing industries, the professions, trade, commerce, and finance; they are entering the better-paid positions, and in some cases finding opportunities in fields hitherto closed to them. Between the years 1910 and 1920 there was an increase in the number of women holding administrative positions, engaging in professional activities, and owning various types of business enterprises. We may expect this progress to continue. In addition to the women forced by economic necessity into the wage-earning classes, there are many who find a real joy in their work and satisfaction in a career which provides opportunity for the expression of creative ability.

Although we regard the growing emancipation of women as vital to the welfare of our National life, we are not blind to the grave issues at stake. If active participation in affairs raises serious obstacles to perpetuating the race, adjustments will have to be made in order to reconcile woman's two most important functions. Industry needs the woman worker; but at the same time, it must take account of the physical limitations of sex. We now accept the employment of single women, and are asking that they be given such education and training as will make them efficient workers. More difficulty is encountered in fitting the married women into our industrial scheme. If we have seemed to emphasize the adverse influence which the employment of women exerts upon population, it is because our data indicate that a decrease in numbers results from such employment. At no time have we raised the question of quality of population. Such a discussion involves complications quite beyond our province.

Before we can reach definite conclusions, moreover, we must have a sounder factual basis upon which to work. The inadequacy of our data is painfully apparent. At many points in the foregoing discussion, questions arise; insistent problems call for additional data and the careful analysis and correlation of existing material. There are no American statistics comparable to those contained in the excellent British *Report on the Fertility of Marriage.* We greatly need a similar study, which will give information on the relative fertility of the different social classes, the age of marriage of employed and non-employed women, the duration of marriage, the number of children born, and the number of children surviving, classified according to the specific occupation which the mother follows. We ought also to know the length of time married women stay in industry before and after marriage. Does the woman continue the same occupation after marriage that she formerly pursued? How many of the married women in industry seek gainful employment only after their children have grown up? Do married women, returning to work in later life, enter the same occupations which they followed in girlhood? Mortality- and morbidity-rates, classified according to occupation, would prove invaluable in helping to devise a rational protective program for women workers. Because of the absence of adequate records, there is no method for evaluating the indirect influence of work done during adolescence upon child-bearing at a later period. Are there any particular ages during which women are more susceptible to occupational disease than they are at other times? These are only a few of the questions that our present state of knowledge leaves unanswered.

PART VI

OUTLOOK FOR THE FUTURE

CHAPTER XVII

EFFECT OF THE HEALTH MOVEMENT ON FUTURE POPULATION

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The ascertainment of the way in which the health movement will probably affect the population of the future is a many-sided problem. It is often assumed that the advancement of medicine and hygiene is bound to cause a certain amount of racial deterioration because the weaklings are thereby kept from being eliminated by natural selection. Mr. A. E. Wiggam, for instance, warns us that medicine and hygiene 'are weakening, will weaken the human breed.' 'Vice and disease,' he tells us, 'purify the race because they kill the weak and vicious. They leave the strong, robust, and virtuous to hand the torch of heredity to men unborn.' Possibly this is true. *A priori*, it sounds sufficiently reasonable. But it may be only partly true, and there may be counter-tendencies which, even from the standpoint of eugenics, serve to offset some of the racial ills which result from the saving of more lives. At any rate, the conclusion is one which requires careful scrutiny if our acts are to be in any way affected by it.

No one, so far as I am aware, recommends the cessation of medical aid and public health activities on account of their alleged injurious effects upon our racial vigor. Prospects of decadence through the decline of the death-rate are generally cited to impress us with the urgency of eugenic reform. But the chief occasion for alarm from the eugenical standpoint is to be found, I believe, more in the anomalous distribution of birth-rates than in the mere reduction of mortality. After all, it is the differential birth-rate that counts in evolution. It is birth, not death, that leads on to further development, the death of the unfit being favorable to advancement simply because it prevents the unfit from producing inferior progeny. If the unfit were not eliminated, but merely failed to reproduce, the outcome would be very much the same.

The course of evolution, then, is really directed by the quality of the birth supply. I do not know to what extent the regulation of births forms a part of the program of the public health movement. But even from the standpoint of hygiene and the saving of human life in both mother and child, to say nothing of its eugenic and social aspects, the subject is one of prime importance. The indirect effects of properly controlled births on public health and welfare would, I believe, be very great, but it is not my intention to dwell upon this aspect of the subject. My present concern is with Nature's way of controlling the birth supply by killing off the unfit.

We have been interfering quite extensively with Nature's summary methods of disposing of her inferior progeny, and it is only to be expected that many people should have become apprehensive lest Nature should resent this artificial interference, and take her revenge in her own good time. Nature has made us what we are through the slow process of selective survival. It is highly desirable, therefore, to know just how our procedure in saving life is affecting this creative process. The problem is many-sided and presents numerous difficulties in the way of obtaining accurate information. In approaching the problem, it will be advantageous, I believe, to present a few considerations for the purpose of general orientation.

Death may be regarded as a function of two factors: the hereditary endowment of the individual, and the influence of environment. Only in so far as death is a function of hereditary endowment does it have any effect on the native vigor of the race. It is fairly obvious, even *a priori*, that causes of death vary greatly in their selective influence. If a vessel goes down in mid-ocean with all on board, there is no opportunity for differential survival. Automobile accidents, which are coming to take a prominent rank among causes of death, are doubtless somewhat more selective, but the relation of deaths from this cause to hereditary endowments is very difficult to determine. Those who have a strong native constitution are more apt to survive their injuries. On the other hand, the automobile may to a certain extent play the rôle of the fool-killer; or again it may, on the average, kill off the more energetic because they are more frequently exposed to injury than the less hardy. On the whole, there seems to be little to indicate that this rapidly growing cause of death is selective in any way that is racially beneficial. Not improbably, as is claimed for war, the automobile tends to eliminate the more vigorous and enterprising types of humanity.

When, on the other hand, we consider such a cause of death as hæmophilia, which is transmitted as a recessive sex-linked character, the importance of the hereditary factor is clearly manifest. In the celebrated Mampel family, eighteen out of the thirty-six deaths that occurred were traceable to this hereditary defect. In Huntington's chorea, which is inherited as a strongly dominant characteristic, we have another malady which quite uniformly leads to a fatal termination. Between entirely non-selective causes of death and deaths which are the inevitable outcome of an individual's unfortunate heredity and therefore highly selective, there are all gradations. In order properly to evaluate the effect of the public health movement on the native vigor of the race, we need to know, first, what causes of death have suffered the greatest reduction, and, second, the relation of the chief causes of death to the hereditary constitution of the individual. If it should turn out that the greatest advances have been made in the conquest of those causes of death which are least selective in their action, the result need not cause us so much inquietude.

Now when we examine the mortality statistics of most civilized countries for the past few decades, the general fact which stands out most clearly is that there has been a relatively great reduction in mortality from various contagious and epidemic diseases, such as tuberculosis, typhoid, smallpox, scarlet fever, diphtheria, and cholera, while there has been relatively little improvement in the death-rate from many organic diseases in which the constitutional diathesis is apparently a large element, such as diseases of the heart, Bright's disease, diabetes, angina pectoris, and various other so-called degenerative diseases which affect especially middle and later life. Cancer, at least statistically, has been on the increase. (See Figure 6.)

There are, however, a few exceptions to both these conclusions. Measles continues to persist with relatively little abatement. Influenza occasionally expresses a supreme contempt for our epidermiologists; and pneumonia, while it has decreased in the United States, has, until quite recently, been increasing in England. It is, however, in these unconquered infectious diseases that we may reasonably hope for material reductions in the death-rate in the not distant future. We may also make considerable progress with the diseases of the class I have designated as constitutional. I shall not venture to prophesy what may happen in the control of any classes of diseases or disorders. My chief contention is that up

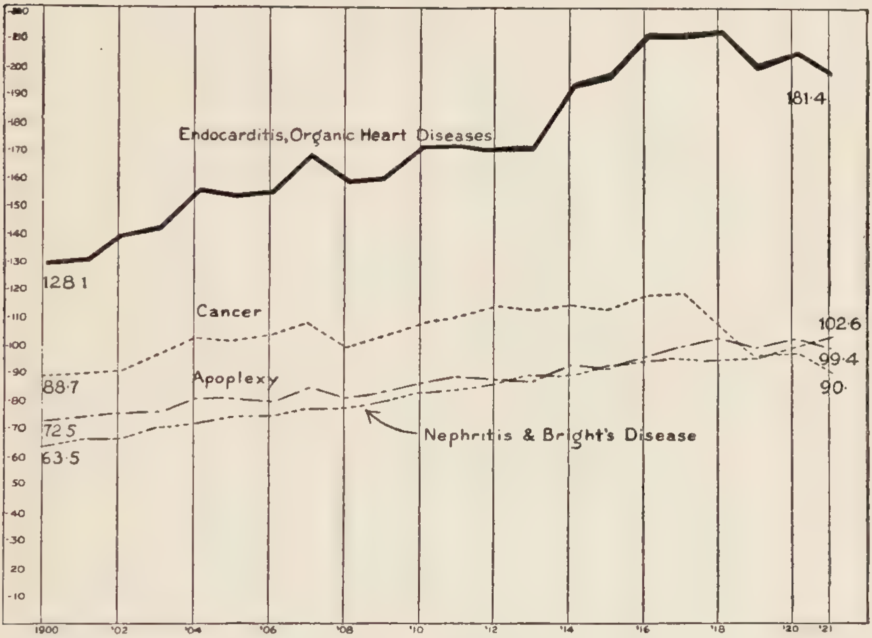

FIGURE 6. DEATH-RATES PER 100,000 POPULATION FROM THE FOUR CHIEF CAUSES OF DEATH FROM ORGANIC DISEASES

Data covers the original United States Registration Area. Apoplexy includes cerebral hæmorrhage.

to the present time the principal triumphs of preventive medicine and hygiene have been in the control of contagious and epidemic diseases in which an environmental factor, in the form of some kind of micro-organism, plays an indispensable part.

Now it must be admitted that the constitutional factor is also of importance in germ diseases. It is probable that there is an hereditary diathesis to tuberculosis. There is some evidence that there is an hereditary immunity to various other infections, such as diphtheria and scarlet fever; but granting that differences in hereditary susceptibility to many germ diseases are of common occurrence, there arises the important question as to how hereditary immunity is related to the natural vitality or vigor of the individual. Some germ diseases, such as tuberculosis, may be especially prone to attack those who inherit a weakened vitality; but it is by no means evident that immunity to germinal diseases in general is strongly correlated with native vigor. Pneumonia very frequently carries away men of unusual vitality, and diphtheria is apparently about as apt to attack the strong as the puny. The hereditary factors upon which natural immunity to many diseases depends may be found, like those which are known to cause immunity to rust in certain grains, to be Mendelian characters which have little or no relation to the general vitality of the organism. Resistance to many germ diseases may depend on more or less specific bodily reactions. Once a disease is taken, however, the element of constitutional vigor is probably of great importance in determining a favorable prognosis. The superiority of the vigorous person's chances, therefore, depends on the disease with which he is afflicted. If he contracted the plague, the African sleeping sickness, or hydrophobia and failed to take the Pasteur treatment, the constitutional factor would probably make very little difference in the final result. With most germinal diseases native vigor is doubtless important, although specific immunity reactions may reduce the importance of vigor as a factor in survival. We are here largely in the stage of conjecture. But we may safely draw the general conclusion that the effect of different diseases as selective agents which operate on the basis of hereditary differences in native vitality differs greatly in different diseases.

In some diseases the selective effect may be very little; in others considerable — how much we cannot measure.

But what can we say of the selective effect of the constitutional disorders? The answer to this question depends upon the extent to which these disorders depend upon heredity. If they do not depend upon heredity, then the deaths resulting from them will make no difference in the heredity of the race. While we have much to learn as to the rôle of heredity in this class of diseases, we do know something more about it than we do in regard to germ diseases. Among inherited constitutional traits which materially shorten life may be mentioned myxœdema, xeroderma, hypertonic blood pressure, hæmophilia, fragility of bone, pernicious anæmia, progressive muscular dystrophy and atrophy, and Huntington's chorea. To these must be added the many forms of insanity to which there is a strong hereditary proclivity, and which materially reduce the span of life. Epilepsy and the various grades of feeble-mindedness are strongly inherited and generally shorten the life of their victims. Then there are many diseases which are not always inherited, but which may depend to a greater or less extent upon an hereditary diathesis. We must rank in this category such causes of death as diabetes, Bright's disease, arterial sclerosis, goiter, possibly cancer, and numerous rarer disorders. The number of these rarer constitutional defects of a heritable nature which have been described is very great, and their combined influences on the general death-rate is by no means negligible.

Of course, infections enter as a factor in some of the diseases classed as constitutional. Epidemic diseases and focal infections play a part in the causation of nephritis, heart disease, and various disorders of the nervous system. But there are very many organic disorders which are apparently independent of the influence of the toxæmias caused by micro-organisms. And where the bacterial infection affords the occasion for the development of a constitutional disorder, a predisposition based on heredity is probably a common occurrence.

Whatever we may be able to say as to the hereditary differences in proneness to take or succumb to the various germ diseases, we are justified in concluding that, so far as our present knowledge goes, the hereditary diathesis is a more potent factor in the disorders of constitutional origin than in those caused by bacterial or protozoan infections. If this be true, the germinal diseases as a whole are relatively less discriminating as selective agents than the constitutional disorders which are largely generated, as it were, from within.

In order to gain a little more insight into this problem, I have made a study of the sex incidence of mortality from various causes in the first year of life. The reason for studying the relation of mortality to sex is because sex represents a constitutional difference dependent upon hereditary factors, and one which is at the same time closely related to vitality. Many more boys than girls die in the first year of life. The proportion of boys dying is greatest in the first month and decreases throughout the year, and afterward slowly diminishes throughout successive years of childhood. But even in advanced ages, women have a greater expectation of life than men. The proportion of boy deaths in stillbirths is higher than in deaths during the first year of life, and it is even higher in abortions. The earlier the abortion, the higher the percentage of males. The female of the human species is apparently the stronger sex. With the occasional exception of a few years during the child-bearing period and sometimes for a while in the teens, natural selection discriminates against the male all through life.

The sex incidence of various causes of death may be considered a rough index of their selective action. In the Registration Area of the United States, the average ratio of male to female deaths in infants from 1900 to 1921 (inclusive) is 128.3. Infant deaths from 'general diseases,' which include tuberculosis, dysentery, influenza, measles, diphtheria, and the other common infections of childhood, show a low sex ratio, 116.2. When we come to nervous diseases, the male-female ratio rises to 134.3. Perhaps the larger head of male infants, with the frequent injury inflicted during delivery, may be a potent factor in causing to take a severe form the inflammatory diseases of the nervous system, such as meningitis and encephalitis. With diseases of the circulatory system, of which organic diseases of the heart greatly preponderate over all others combined, the sex ratio is 133.7. Diseases of the respiratory system, which are to a large extent directly due to infections, show a sex ratio of 128.6. With the largest category of infant deaths, diarrhœa, and enteritis, the sex ratio is significantly lower than the average, namely, 123.3. But the sex ratios of hernia and intestinal obstruction, 182.7, and yellow atrophy of the liver, 149.2, are much higher than the average. Bright's disease[1] and nephritis, which include most of the genito-urinary diseases of childhood, have a sex ratio of 151.1 and 143.8, respectively. Skin diseases, on the other hand, which are mostly infections, have a ratio of 122. Malformations show a high ratio, 132.3, especially congenital malformations of the heart, 141.8. The ratio of deaths from early infancy is 136.8, and from injuries at birth, 161.1. In sharp contrast to these is the ratio for various external causes, largely accidental, which is 121.4.

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[1] Now classed as nephritis in the United States mortality statistics.

In general, we may say that despite certain curious outstanding exceptions, such as tetanus and some of the inflammatory diseases of the nervous system, the germ diseases have a relatively low sex ratio. On the other hand, the disorders of constitutional origin, again despite certain curious outstanding exceptions, such as hydrocephalus (118.3), if this is really an exception, have a relatively high sex ratio. In this connection, I wish to call attention to another circumstance in regard to the relative improvement in infant mortality during the several months of the first year. Infant mortality is relatively high in the first month, and it is a significant fact that the marked reduction in infant mortality which has occurred in the last two decades has been made chiefly through saving the lives of babies over one month of age. (See Figure 7.) The mortality of infants in the first month has declined relatively little. Now we might suppose that, owing to the frailty of early infancy, the improvement of conditions influencing infant mortality would have its greatest effect in the earliest period of life. But it is quite the reverse. Are these early deaths largely due to constitutional causes? If we turn to the sex ratio for light on this question, we find that it tends, in accordance with our interpretation, to answer the question in the affirmative. The ratio of boy deaths to girl deaths in the first month is unusually high. At this period also, deaths from such causes as premature births, malformations, marasmus, and convulsions, preponderate over deaths from intestinal infections and the common germ diseases of childhood, while later in the year this relation is reversed. The ratio of boy deaths to girl deaths goes down as the ratio of deaths from infections to deaths from constitutional causes goes up. The reduction of the death-rate in the first years of life tells the same story as the reduction of the death-rate in the general population.

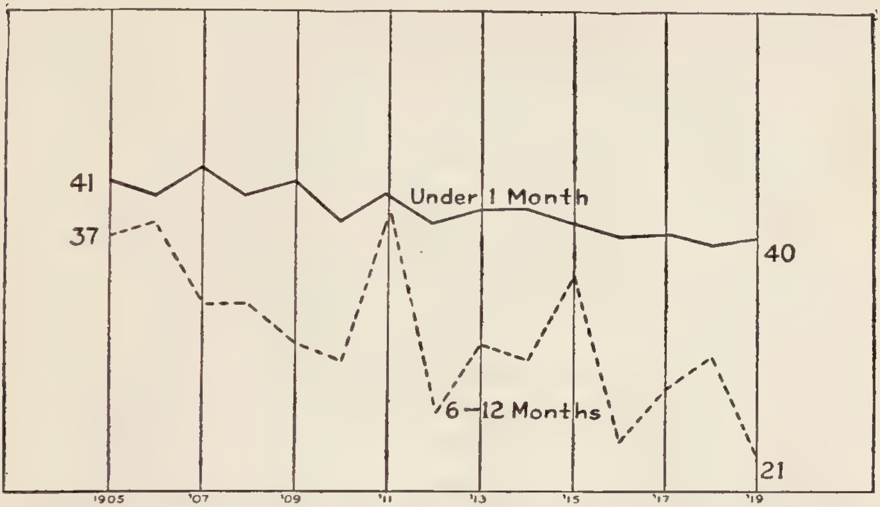

Figure 7. Death-Rates per Thousand Births of Infants under One Month and of Infants between Six and Twelve Months of Age in England and Wales

There are reasons for believing that, in a very broad and general way, the reduction of the death-rate due to advances in medicine and hygiene has taken place, as we might expect *a priori*, through the removal of those causes of death which are less selective in their action. Perhaps we may congratulate ourselves that such is the case, because, whether our efforts to reduce the death-rate are resulting in racial degeneration or not, they are quite certain to be continued. The conquest of infectious diseases would remove an immense amount of trouble due to the impaired efficiency that follows the diseases from which people recover. From the viewpoint of health, happiness, and efficiency, the race would doubtless greatly profit, for a considerable number of generations, at least, by the removal of the germ diseases and infections. Nature might, however, take her revenge later on. We must seriously reckon with a certain degree of deterioration due to the removal of causes of death which there is reason to believe have some selective value. But however successful our efforts in this respect may be, there will remain many causes of death, highly selective in their effect, which will always be working to keep our native vitality up to the standard.

We need not have any illusions about our doing away with natural selection. As a matter of fact, it is seriously open to question if we have on the whole been reducing the action of natural selection at all. That the death-rate has been greatly reduced admits of no doubt. But our advance in the arts of saving life has been coincident with a great development of industrialism, which has led to congested urban populations, great inequalities in the conditions under which people live, and consequently to great differences in the incidence of death among different industrial classes. Now it is not so much the gross death-rate that is significant in natural selection; it is the differential death-rate. Our industrial régime produces a fearful amount of wreckage. Any one who studies tables of occupational mortality cannot fail to be struck by the very great differences in life expectancy among the followers of different trades and professions. The lot of the man of subnormal intelligence (I do not mean the positively feeble-minded) is one that subjects him, and especially his children, to a relatively high incidence of mortality. The great rank and file of people of this grade of intelligence go into occupations in which wages are relatively low, and in which death-rates are high, and the rate of infant mortality is frequently two or three times as great as among workers of higher grade. There is, I believe, a very discriminating selection taking place at present on the basis of levels of intelligence. Were low intelligence not correlated with high fecundity, as it unfortunately is, this selection would be a potent factor in progressive evolution. If the health movement should bring about a restriction of the birth-rate of the subnormals, it would not only ameliorate the sanitary condition of this element of the population, but it would compensate to a considerable degree for the dysgenic effect of the reduction of the death-rate. It would, however, lead to an increase of native intelligence and the qualities that lead to success, rather than primarily to toughness of constitution. The latter would be affected largely through being correlated with the former.

The public health work that promises to be the greatest racial menace is not so much the reduction of infectious diseases, as the efforts to equalize the death-rate by saving the incompetent and improvident from the natural consequences of their own defective endowments. Let us hope that some system may be devised in which the propagation of subnormal humanity will be discouraged and the multiplication of those with superior mental physical endowments be encouraged. If we can somehow correct the evils of the differential birth-rate, natural selection will, I believe, prove to be a very effective instrument of racial progress despite everything we can do to prevent it.

There is always a tendency for populations to maintain a certain balance between births and deaths. In so far as fundamental biological tendencies are not artificially interfered with, the prevention of deaths from one cause tends to increase the density of population and therefore to bring about an increase in deaths from other causes. This is why the removal of non-selective causes of death favors the operation of natural selection. If fewer people were removed by mere accidents, for instance, there would tend to be a greater pressure of population, and this would tend to increase deaths from other causes which would probably be more selective than the accidents. If fewer people died of germ diseases, more would die of other causes. Would these other agencies be more or less selective in their action than the germ diseases? From the standpoint of sanitation, merely, little would be gained if the reduction of deaths from one cause should be completely compensated for by the increase of deaths from other causes. But our experience proves that the compensation is only partial. The question, then, is this: Will the increase of deaths from other causes which would follow the conquest of germ diseases, compensate, from the selective standpoint, for the loss of the selective influence which the germinal diseases exert? This is a very difficult question, and the answer might vary with different populations. In regard to the effect of reducing mortality from germ diseases, we may, therefore, hazard two statements: first, that germ diseases are probably not so strongly selective on the basis of hereditary differences in vitality as are the constitutional or developmental disorders; and, second, that the removal of the selective effect of germinal diseases would be partially compensated for by other selective agencies whose action would be thereby increased.

One who speculates upon the probable effect of the public health movement on the qualities of the race is inevitably compelled to consider the possible influence of deleterious agencies on the character of the variations which arise in the germ plasm. Unfortunately, the causes of germinal variations are at present almost wholly unknown. During the past few years, however, some evidence has been accumulating which points to the conclusion that hereditary defects sometimes arise in response to agencies which may injure the germ cells. There are the well-known experiments of Stockard on the hereditary influence of alcohol in guinea pigs, and the corroborative work of McDowell on rats. Guyer's results on the effect of lens emulsion in producing hereditary eye defects possibly belong in the same category. Radium emanations and X-rays are known to injure chromatin, as has been proved by the experiments of Bardeen on the spermatozoa of the toad, and the studies of the Hertwigs on frogs and sea-urchins. The recent work of Bagg and Little has shown that X-rays have probably given rise to several hereditary defects in mice. Thus far all of the characteristics which have arisen in response to injurious outer agencies have been defects.

For a long time many students have been convinced that a large proportion of the hereditary defects of human beings, such as feeble-mindedness, epilepsy, insanity, and numerous other signs of physical and mental degeneracy, owe their origin to alcohol, the toxins of disease, or some other agency that directly or indirectly injures the germ plasm. Francis Galton has remarked that 'our human civilized stock is far more weakly through congenital imperfection than that of any other species of animals, whether wild or domestic.' How do these defects arise? If they arise in part as the result of unfavorable conditions which the public health movement may be instrumental in removing, then this movement will go far toward compensating for the dysgenic effect of a reduction of selection. If a cause of death, such as alcohol, creates the variations which it eliminates, the removal of this cause would probably be a racial gain. It is at least open to question whether an environment which is most wholesome from the standpoint of individual well-being is not at the same time the best from the standpoint of welfare of the race. Under such an environment, strains of defective heredity might arise with much less frequency, and possibly variations in the direction of improvement might be of more frequent occurrence than they are at present. We know, as yet, so little on this topic that speculation is of almost no value. If I am not greatly mistaken, the next ten or twenty years will bring us a much clearer vision of this field than we now possess. After all, the real action of natural selection is determined by the kind of variations which happen to make their appearance Some day we may be able to supply the conditions which favor the production of variations in the direction of progressive evolution. Up to the present time, so far as we have been able to do anything at all in controlling variability, we have simply succeeded in spoiling what Nature has accomplished.

CHAPTER XVIII

FAMILY ALLOWANCE SYSTEMS AND THE FUTURE OF POPULATION

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While the proper basis of a living wage has been earnestly discussed in the United States during the last few years, a new system of wage payment has rapidly been taking root in Europe; namely, the practice of adding allowances, over and above the basic wage, for those with dependent children, and in some cases for those with dependent wives and other adults as well. No less than 3 million French workers are paid according to this system, while in Germany it is probably applied to between 4 and 5 million. In Belgium, Holland, Czecho-Slovakia, and other countries, at least an additional million are paid in this manner; and Austria has passed a law making such allowances an integral part of its wage system. Recent developments in New South Wales and in the Commonwealth of Australia indicate that some such system may well be adopted there as a means of solving the dilemma which has developed under the State regulation of wages.

The first question which will naturally be asked is whether such a system does not cause the employers to discriminate against men with dependents in favor of the single workers. Such a system, it is said, will cause the married men with children to be the last hired and the first to be laid off, and consequently will leave them in a worse position than that in which it found them. This danger is met by the device of equalization funds, of which there are no less than 164 in France, whereby the employers of a given trade or locality band themselves together so that the allowances paid to the families of their workmen will be a charge upon the equalization fund as a whole, and not upon the specific firms that employ the heads of families. Those with dependents are protected by the fact that the employers in turn pay assessments into the fund on such bases as the number employed, the time worked, or the amount of the wages bill. The way in which this protection is afforded may be illustrated as follows: One hundred firms, who employ 50,000 workmen, with 60,000 dependent children, and whose total annual wages bill is $60,000,000, form an equalization fund. The average allowance per child amounts annually, let us assume, to $100. The total yearly burden upon the fund is, therefore, $6,000,000. The employers would contribute $120 for each worker employed, or 10 per cent of their wages bill. Since the same assessment would be paid by an employer for a single man as for a father of eight children, there would be no inducement for a given employer to discriminate against those with dependents.

Such a system as this, with its emphasis upon payment according to need, is, of course, a direct challenge to our present practice of making equal payments to single men and to fathers of families. While the European systems of family allowances have certain flaws — such as the fact that the allowances have been merely superimposed upon existing money wages, with no attempt to fix a just basic wage; the general insufficiency of the allowances themselves; and their use by employers to weaken the position of the trade unions by penalizing strikes — these are not essential to the basic principle of the system, which is, of course, the graduation of the minimum wage according to the family needs of the worker.

It is only, I believe, by such a system as this, purged of its abuses, that the problem of the living wage can be solved. The contention that all male workers should be paid enough to support a family of five, which is the claim of most advocates of the living wage to-day, must give way to the variable wage advocated above. This is true for two reasons: first, only a small proportion of workmen have a family of five to support, the vast majority having fewer than that number, while a considerable percentage have more; second, it seems undeniable that industry at present cannot afford to pay all adult workers enough to support a family of five.

The error of supposing that most workmen have families of five to support is clearly shown by the statistics of family composition in various countries. Thus, according to the English Census of 1921, as tabulated for the first fourteen counties, 26.5 per cent of all occupied males were bachelors, and the majority of them certainly had no one, let alone a family of five, dependent on them. Forty-two out of every hundred of those who were married or widowed had no children under sixteen (or made no statement), twenty-three had one such child, sixteen had two children, nine had three, five had four, and five had more than four children. Even after making all possible allowances for the fact that the number of those without dependents is probably overstated, it seems apparent that not more than 10 per cent of the English workers have a family of five to support, while nearly 80 per cent probably have fewer than this number, and slightly over 10 per cent have more.

In this country such statistics as we have indicate a situation substantially similar to that in Great Britain. Approximately 27 per cent of our adult males are unmarried. The probable number of children dependent upon those who are married is indicated in the investigation by the Bureau of Labor in 1901.[1] Nineteen per cent of the 11,156 normal families studied at that time had no dependent children under fourteen, 23 per cent had but one child, 24 per cent had two, 18 per cent had three, 11 per cent had four, and 5 per cent had five. The study of some three thousand families in Chicago by the Illinois Health Insurance Commission in 1918 showed that 65 per cent of the families had fewer than five members (a term which included adult wage-earners as well as dependents); 13 per cent had just that number; while 22 per cent had more than five.[2]

Instead, therefore, of the family of five being typical, it is probable that at the outside not more than 10 or 12 per cent of the workers have such families, while approximately 75 per cent have smaller families and from 10 to 13 per cent have larger families. To pay the same so-called 'living wage' to each worker would mean paying the single men and those who are married, but have few or no dependents, sums vastly in excess of their needs. At the same time such a wage would not meet the necessities of those with more than three children. This group in England, while it comprised only 10 per cent of the families, included no less than 38 per cent of the children. Approximately two fifths of the children would then still be in want, even were the 'family-of-five wage' to be paid.

The fallacious nature of the family-of-five contention is further shown by the fact that had the 28.3 million adult, occupied males in the United States in 1920 been paid such an amount, provision would have been made for over 141 million people. But since there were then actually less than 106 million people in the country, maintenance would have been provided for 36 million fictitious wives and children. Nor is this all. If we regard the 6.2 million occupied women and the 6.3 million juveniles of fifteen years and over as on the average self-supporting, it would have meant a payment for 48 million non-existent dependents. If on top of this we should accede to the argument of the left-wing feminists that women's wages should be equal to those which the men claim, we should be paying for 172 million people or, allowing for employed juveniles, for 72 million more than actually existed.

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[1] *Eighteenth Annual Report*, United States Commissioner of Labor, Washington, 1903; p. 568.

[2] *Report*, Health Insurance Commission of the State of Illinois, Springfield, 1920; p. 191.

In the light of these facts, it is not strange that industry does not seem able to pay all adult male workers the wage that is commonly demanded. Allowing $1700 as the cost in 1920 of maintaining a family of five, and $850 that of supporting a single woman away from home, and setting the minimum wage for female and male juveniles at $9 and $11 a week respectively, we have an approximation of the total cost which such an income scale, if applied to all gainfully employed workers, would entail, shown in the table on page 278.

According to these computations, therefore, no less than 58.4 billion dollars would apparently have been required to provide the bare basic minimum to all those gainfully employed. Had $1600 been used as the figure for adult males, $800 as that for the women and $500 and $400 for the juveniles, the total would have amounted to 54.9 billion.

It should, of course, be observed that the cost of living in rural regions would not have been so great as has been stated, and that therefore the total cost would not have amounted to 58 billion. But when it is considered that the size of the National income in 1919 was only 66 billion, and that it probably did not exceed 74 billion in 1920, it seems probable that the surplus over the basic wage would not have been sufficient to provide for differential wages for the more skilled, for the necessary payments of interest, profits, and rent, and for the necessary amount of saving.

Differential payments are necessary for the skilled and semi-skilled trades in order to induce men and women to go through the necessary period of apprenticeship when earnings are low. They are also necessary to induce the workers to give their best. To pay one quarter of the workers a differential of 50 per cent over the basic wage would be an exceedingly modest provision, but it would absorb on the scale described above over 7 billion dollars. Since saving commonly necessitates a sacrifice of present enjoyment, some interest will have to be paid. Furthermore, as long as any considerable proportion of industry

A FIRST APPROXIMATION OF THE PROBABLE COST IN 1920 OF PAYING THE GAINFULLY EMPLOYED WORKERS THE INCOME CUSTOMARILY DEMANDED AS NECESSARY

CLASS OF GAINFULLY EMPLOYED	NUMBER IN CLASS IN 1920 (in millions)	APPROXIMATE PER-CAPITA AMOUNT REGARDED AS NECESSARY IN 1920	TOTAL COST IN 1920 (in billions)
Adult males (20 years and over).....	29.7	$1700	$50.5
Adult females (20 years and over)....	6.7	850	5.7
Boys (15 to 19 years)...............	2.8	550	1.5
Girls (15 to 19 years)...............	1.6	450	.7
Total...........................	40.8		58.4

is conducted under capitalism, profits must be paid to those firms who are able to produce at a lower cost than the market price. Rent, too, will have to be paid for the use of land as long as society allows individuals to appropriate what is socially created.

Under any system of social organization, moreover, fresh savings will have to be made if the material condition of the people is to improve. At present, 10 to 12 per cent of the annual National income is not immediately consumed, but is saved through the addition of more buildings, machinery, etc. To maintain even the lower percentage of saving would have absorbed over 7 billion more. It thus appears highly improbable that industry as at present organized can pay to all workers enough to maintain a family of five.

In order to ascertain the financial resources of industry with greater precision and to eliminate any error caused by the inclusion of agriculture, the author has analyzed the financial status (as shown by the 1919 Census of Manufactures) of each of the 356 manufacturing industries. Had all the interest and profits accruing to the owners been given instead to the workers, in 38 per cent of the industries wages would have been increased by less than $300; in 69 per cent, the increase would have been less than $500, while in only 10 per cent would there have been a gain of more than $800 annually.

Taking the manufacturing industries as a whole, had all the income received by the owners been divided equally among wage-earners and salaried workers alike, the total average wage in 1919 would have been $1485, or, if the surplus had been shared by the wage-workers alone, $1537. Since 11 per cent of the employees were women and 12 per cent were juveniles, it seems probable that the average wage of the adult male could have been raised to

$1700, or the approximate amount necessary to maintain a family of five in Philadelphia at that time. But we must not forget that this would not allow anything for differential wages for the more skilled trades and professions, nor anything for interest, profits, rent, or new savings, and that hence it would have been impossible to have paid such a basic wage to all.

Is it not apparent, therefore, that the family of five must be given up as the standard of a living wage, both because of its gross variance with the facts of family composition and because of its financial impracticability? But while this application of the living-wage principle is unsound, the principle that the workers and their dependents should be given enough to maintain them on at least an adequate physical basis of life is ethically and economically sound. There are three major steps involved in making this principle a practical reality, namely: (1) the establishment of a proper base wage; (2) the granting of adequate allowances for those with dependents; (3) the creation of broadly constituted and directed equalization funds. In my opinion, a proper basic wage should be the cost of living for the single man living away from home without dependents. A liberal allowance for saving should be made, so that the initial cost of setting up housekeeping upon marriage may be met. If the cost on a subsistence-plus level for a family of five were $1600 a year, as seems probable in our larger cities to-day, the cost for the single man on the scale outlined would be approximately $800. The minimum for women should be the same, for the single woman living away from home seems to need as much as the man. If her food amounts to less, her room and her clothes must cost more. The provision of an equal minimum for men and women would remove the danger of women under-cutting the men's rate, while it would permit gifted women to receive more than the minimum and hence more than the less able men. Due to the difficulty in deflating the wages which single men now receive, it may be practically advisable to fix the minimum at the amount necessary to support the childless married couple.

If the needs of the single man are taken as the standard, then men with non-gainfully employed wives should be given an allowance to compensate for the added financial burden. This, on the scale outlined, would necessitate an allowance of approximately $250. An allowance for each dependent child under the age of sixteen should be made in any case, which for administrative reasons should probably be a flat allowance of approximately $200 a child. Adult dependents should be provided for as well as juveniles, although this will not be as necessary if the cost for man and wife is used as the standard for the basic wage.

I believe it would be desirable to have the allowances paid to the mother of the family and not to the father, both because the children would then be more likely to profit by the grant, and because it would dignify motherhood and make the wife less dependent financially upon the husband.

Funds to prevent discrimination against men with dependents are a necessity in any system supported by industry. Such funds should preferably include all the employers in a given geographical district, rather than in one local trade group, in order to equalize the burden between trades and to provide uniform rules and administration. The funds should preferably be administered by both workers and employers to prevent the system from being used to weaken the position of organized labor.

Such a system as this would protect the larger families without showering unneeded surpluses upon the unmarried. Since the minimum guaranteed would be only a subsistence-plus standard, men would still have a strong incentive to work effectively in order to earn more than the minimum. The fact that the allowances would be discontinued during the time lost if a worker were discharged because of inefficiency or misconduct, or if he left his position without sufficient cause, would also tend to keep the worker at work. In short, it would guarantee a minimum basis of life without appreciably lessening the incentive for effort.

Such a system, moreover, would be financially practicable. The payment of the scales advocated would have cost in 1920 approximately 30 billion dollars to guarantee a basic income of $800 to all gainfully employed adults, while the allowances would have required 12 billion more. This would have been approximately 42 billion, or about 21 per cent less than the cost on the same scale of applying the family-of-five wage. Had it been employed for wage-earners alone, it probably would have cost 23.6 billion. This was 7.3 billion less than the 30.9 billion that would have been required had the family-of-five wage been used. The cost of such a system in manufacturing in 1919 would have been 10.8 billion. This was 11 per cent less than what was actually paid out in wages and salaries during that year, and 22 per cent less than the family-of-five stipend would have cost. It seems probable, therefore, that industry could bear the strain of the application of the family wage system, since it would necessitate little or no increase in the wages bill.

For all these reasons, therefore, the family allowance system seems destined to spread among the English-speaking countries, as well as among those of Continental Europe.[1]

Two dangerous effects, however, which such a system might possibly have upon our future population deserve to be closely scrutinized. The first is that it might lead to an undue quantitative expansion of population; the second is that this increase might take place in precisely those sections of the population which are presumed to be on the average the least capable intellectually.

The first fear, that of Malthus, is and always has been one of the most stubborn objections to all plans for social reform. But there are at least three mighty forces at work in the world to-day which were not present to any considerable degree in the world of Malthus. The first is the increasing desire of the working class for more of the good things of life, and their resolute refusal to consider themselves consigned by the natural order of society to a low standard of living. It may have been true in 1800 that to guarantee a physical minimum to the family of an English agricultural laborer would have been merely an invitation to further multiplication. But the worker of that day did not have the present worker's desire for a higher standard. A caste system of society prevented him from lifting his hopes to a bettered status for either himself or his family, while the general low level of living about him made him more contented with his lot. Under such conditions, it is small wonder that Malthus placed but little reliance upon the preventive check.

But the democracy in consumption which the Industrial Revolution has introduced has removed the sumptuary barriers which formerly prevailed. The humblest workman of to-day claims the bountiful table, the well-cut suit of clothes, the automobile, the radio set and the victrola as his prerogatives, if he can but gain enough to buy them. Never, perhaps, have the material desires of men so far outrun their existent standard of living. To guarantee a physical minimum to the children of such men would not compensate the parents for the loss in material comforts which they would sustain. To maintain the new child on the scale desired would cost, let us say, $300 or more, while the allowance would amount to only $200. The whole family would, therefore, still have to reduce its standard of life, and this would curb an undue expansion in numbers. Moreover, many families who are to-day living in poverty would, by being guaranteed a physical minimum, come to want the comforts which to-day they dare not hope for. Such families might well limit their numbers to a much greater extent than at present in order to climb up the social ladder upon the first rungs of which their feet would have been placed.

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[1] For further explanation of the theory and practice of family allowances, see Eleanor Rathbone, *The Disinherited Family;* International Labour Office, *Family Allowances* (Studies and Reports, series D, no. 13); and Paul H. Douglas, *Wages and the Family*, Chicago, 1925.

The second force at work to-day is the growing social and economic emancipation of women. There are costs other than purely economic ones in bearing and rearing children — costs ignored by Malthus — against which the hard-worked women of the eighteenth century did not think of protesting. The pain and suffering of childbirth and the drudging labor of bringing up a family of children is a cost of which the women of the Western world, at least, are becoming conscious. There are very clear indications that women of the upper economic groups are not alone in their desire to be freed from the oppressive burden of continued child-bearing and child-rearing.

And finally, of course, there is birth-control, which will undoubtedly be used by both fathers and mothers to prevent the family from being swamped with children.

Despite the hostility of governments and of churches, the movement toward birth-control is spreading rapidly downward through the population and now gives to mankind the possibility of controlling its numbers, without pain or suffering, and hence enabling men at last to enjoy those material fruits of mechanical progress which an earlier and gloomier school of economists prophesied that they could never possess.

But there are many who believe that the men and women in the ranks of unskilled and semi-skilled labor would not be swayed by these motives. Such groups, it is said, are poorly endowed mentally, and would be satisfied with a mere physical existence. It is urged that to guarantee to such persons a minimum of subsistence would not make them want more and hence induce them to limit their families, but would further increase the differential fecundity of these less gifted classes and thus hasten the swamping of civilization by the less fit.

To such an objection as this there are several lines of reply. In the first place, despite the army tests, it is by no means certain that the unskilled workers as a class are greatly inferior mentally to those in the upper economic groups. That there are differences in the average ability of the various classes does seem certain, but that they are as great as Lothrop Stoddard and William McDougall believe is, indeed, doubtful. These revivers of the aristocratic faith, who are also resuscitating the doctrines of Nordic superiority, confuse innate ability with cultural attainments. This is as great a fallacy in passing judgment upon the relative merits of classes as upon those of races.

In the second place, the social defectives should, of course, be prevented from reproducing their kind. The family allowance system, however, would not weaken, but would probably strengthen, the eugenics movement. Society would probably not be long in seeing that if it was to guarantee a minimum to children who were born, it ought not to permit the breeding of the feeble-minded and defective. It is for this reason that such an ardent eugenist as Leonard Darwin has recently come to favor the system of family allowances.

In the third place, by removing the poverty in which the children of the unskilled and semi-skilled classes are now living, family allowances would vastly improve the opportunities which can be given them. This would be an almost incalculable gain.

It should, moreover, be pointed out to those who are still fearful of the greater fecundity of the unskilled, that it is possible to limit the number of children for whom the allowances would be paid. The maximum, for example, might be fixed at four or five; this would greatly assist the families of low-paid workers, whose average annual wage now seems just about sufficient to support one child, without unduly subsidizing large families. Moreover, family allowances may also be applied to those classes which, it is said, are dying out, just as effectively as to manual workers. Thus accountants, business managers, salaried engineers, teachers, and ministers might be paid allowances for children, especially for the third and fourth. The release of births in these classes, which at present are probably not reproducing themselves, would perpetuate a strain in our population which undoubtedly needs to be continued.

CHAPTER XIX

TREND OF POPULATION WITH RESPECT TO A FUTURE EQUILIBRIUM

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THE process of democracy is one of assimilation. It has meant the breaking-down of class barriers and the adoption by all classes, so far as economic differences permit, of similar customs, manners, costumes, amusements, and forms of belief. Vast agencies of association, means of communication, facilities of travel, newspapers, and books have created the conditions of a common culture which is becoming shared, though in different degrees, by the various strata of society. A common technique pervades a whole civilization, so that all classes live in a similar environment and face the same problems.

But there is one exception to this law of assimilation under conditions of democracy. In one crucial aspect the disparity between classes has widened instead of narrowed. The fertilities of the different social strata have shown, in the last sixty years, a remarkable divergence. Consequently, the reënforcement of the population is taking place in larger measure from the lower economic ranks and in smaller measure from the higher. This is a development of great social significance, but one which is very easily misunderstood. It is the object of this paper to suggest that the present trend of population cannot be understood if we limit our view to its present stage. Remembering how recent these manifestations are, we must examine them in the light of evidence which shows that their operation is likely to continue and to extend. We must, in other words, project the trend into the future.

But in the first place let us give some evidence to show the increased disparity between the fertilities of social classes. The best evidence on the subject is contained in the British *Report on the Fertility of Marriage.*[1] Part II of the *Report* contains a remarkable, and in some respects a unique, contribution to our knowledge of the subject. The Census authorities divided the whole population of England and Wales into eight economic classes:

Class I.	Capitalists, enterprisers, managers, scientists, artists, professional workers, and so forth.
Class II.	Small shopkeepers, artisans whose work contains some elements of the artistic and creative, and the lower (operative) ranks of the professional, scientific, and artistic groups; farmers, i.e., agricultural employers.
Class III.	Skilled labor, including transport service, metal trades, building, furnishing, leather, paper trades, and so forth; domestic service.
Class IV.	Labor requiring a lower grade of skill, where strength is usually essential.
Class V.	Unskilled labor, street traders, and so forth.
Class VI.	Textile workers.
Class VII.	Miners.
Class VIII.	Agricultural laborers.

The first five classes are arranged in descending order of social and economic status, as determined by occupation. There are difficulties in demarcating occupation by classes, but these affect marginal groups rather than the main body within each class. The last three classes are taken out of the general ranking because of special populational characteristics. The first five classes show clearly the well-known phenomenon that both fertility and mortality increase as we descend the social scale. Two of the special classes (VI and VIII) are, however, anomalous in this respect; the textile workers show a correlation of low fertility and high mortality, and the agricultural workers show the opposite correlation of high fertility and relatively low mortality. The peculiarity of the miners (Class VII) is the extraordinary high fertility which, in spite of a relatively high mortality, placed them, at the date of the Census, above all other classes in the disproportionally large contribution which they made to the total population.

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[1] See vol. XIII of the *1911 Census of England and Wales*, 1923.

If we take the statistics for each of the large occupational groups, it is clear that the advantage of lower mortality does not compensate for their lower fertility. This conclusion, so far as England in 1911 is concerned, is established by Figure 8, showing the crude effective fertility of each social class.

Figure 8 also illustrates the increasing disparity between the higher and the lower economic classes. This disparity grows constantly from 1851–61 up to the period 1891–96. The convergence thereafter cannot be taken as indicative of a change of trend, for, as the *Report* points out, in marriages of relatively recent date, the motive for the restriction of fertility is less operative than in those which have been longer exposed to the chance of fertility. On the other hand, the new divergence for the very latest period requires careful interpretation. We must remember that the comparative fertility of classes is affected by changes in the death-rate, no less than by changes in the birth-rate. An examination of the data from which Figure 8 is constructed points to the inference that at least a part of the divergence for the last period is due to the general improvement in infant mortality, which would, of course, affect most those classes where mortality had been highest.

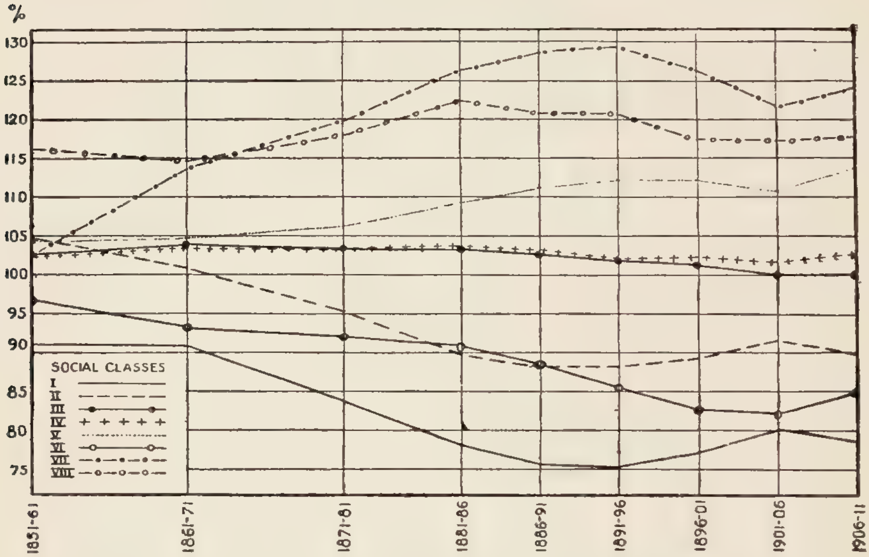

FIGURE 8. CRUDE EFFECTIVE FERTILITY OF EACH SOCIAL CLASS

Per cent of that of the general population for marriages of different dates and durations.

Data from 'Report on the Fertility of Marriage,' vol. XIII of the 1911 *Census of England and Wales.*

Before we conclude that Figure 8 gives us an accurate conception of the situation, we must consider certain factors for which it does not allow. In the first place, it shows effective fertility in terms of the numbers of married men, and not of the total population, recorded within each class. It does not, therefore, make allowance for the differences in marriage frequency between classes. Thus it exaggerates the fertility of the classes which are least married and understates that of those which marry most. Now it appears from the *Report* that, for the age-period 45 to 55, 'the three most fertile classes, VII, VIII, and V (in order of fertility), each contains less than the average proportion of married men, the two latter being the least married classes.'[1] The professional group in Class I comes next, though at the same time the other and more heterogeneous section of Class I heads the list with Classes III and IV. Furthermore, the data do not allow for the families of widowers or of widows, so that differences of class or occupational mortality may possibly disturb the results, since there is greater interruption of fertility under conditions of higher class mortality. A consideration making in the opposite direction is that in the classes which marry earlier, which are also the most fertile, there is a shorter interval between the generations. Some of the children reach the age of marriage and commence new families before the children of the later marrying groups are grown up; hence there is a cumulative increase which our figures do not show.

Our data are insufficient to allow for the mortality incidence of fathers and mothers respectively in each class. But we can represent the total class fertility and consider the frequency of marriage within the class by taking, for each class, the whole number of surviving children registered for marriages, and dividing this figure by that for all males enumerated. This gives us an effective fertility ratio which, though it is defective in other respects, at least takes account of the proportion actually married, as shown in Table I.

This is the nearest we can get to a representation of total class fertility. To it, there are two objections:

(1) Different classes include different proportions of marriages of completed fertility. Thus, among miners the ratio

$$\frac{\text{marriages of incomplete fertility}}{\text{marriages of completed fertility}}$$

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[1] *Fertility of Marriage*, Part II; p. 80.

TABLE I. FERTILITY OF MALES OF DIFFERENT SOCIAL CLASSES

(1) SOCIAL CLASSES	(2) NO. OF MALES IN CENSUS REPT.	(3) NO. OF COUPLES, WIFE UNDER 45	(4) NO. OF COUPLES, WIFE OVER 45	(6) CHILDREN BORN TO (3)	(7) CHILDREN BORN TO (4)	(8) CHILDREN LIVING TO (3)	(9) CHILDREN LIVING TO (4)	(10) TOTAL CHILDREN LIVING	(11) EFFECTIVE FERTILITY RATIOS
I. Upper and middle classes..........	1,305,580	394,925	200,633	751,557	731,372	664,610	589,033	1,253,643	.96
III. Skilled workmen...	2,664,169	976,184	448,291	2,719,485	2,259,477	2,265,568	1,711,783	3,977,351	1.49
IV. Intermediate.......	2,018,427	677,843	327,913	1,947,091	1,633,234	1,609,578	1,241,655	2,851,233	1.41
V. Unskilled workmen.	1,831,778	616,555	286,597	2,078,128	1,528,330	1,650,602	1,112,720	2,763,322	1.51
VI. Textile workers....	440,848	144,932	67,835	345,424	310,090	276,210	224,849	501,059	1.13
VII. Miners...........	900,317	347,032	109,467	1,243,657	685,240	978,561	487,439	1,466,000	1.63
VIII. Agricultural laborers	617,784	142,492	109,547	465,873	626,712	404,928	500,350	905,278	1.47

The table is an attempt to compare effective fertility of males of the different social classes, taking into consideration the proportion actually married, the age of wife at marriage, crude fertility, and effective fertility. The figure in the last column represents total number of children of men of a given class who were alive at date of Census, divided by total number of males enumerated in the class = average number of children per male in the class (married or not). But the total number of males enumerated includes all occupied males over 15 years of age. Among Class I the percentage of males between 15 and 21 may be lower than in other classes (though Class I includes students). If this is so, then the divisor for Class I is relatively smaller than for the other classes, and this will cause some understatement of the reproductive ratios for the lower economic classes. The children of widows and widowers are omitted.

TABLE II. MARRIAGES IN ENGLAND AND WALES

Marriages solemnized during periods 1901–06 and 1906–11, where the wife had not attained the age of 45 years at 1911 Census. Percentage of children surviving at date of Census in: (*a*) *all* such marriages; and in (*b*) such marriages for each social class; also (*b*) expressed as a percentage of (*a*) for each period. Not standardized for age of wife at marriage.

The advantage enjoyed by the middle classes I, II, III, as regards percentage of children surviving, was less for marriages dated 1906–11 than it was for 1901–06. Class VII shows a slight improvement; class VIII shows a great improvement; and the other classes remain comparatively stationary.

Marriages solemnized 1906–11

	ALL CLASSES	I	II	III	IV	V	VI	VII	VIII
Number of couples	1,073,887	122,747	171,095	265 441	181,471	151,032	43,042	99,840	39,209
Children born	973,943	82,790	136,147	236,699	168,618	159,441	33,998	114,821	41,429
Children died	95,674	4,890	10,736	21,677	16,632	19,081	4,189	15,036	3,433
Children living	889,769	77,900	125,411	215,022	151,986	140,360	29,809	99,785	37,996
Per cent living	91.4	94.1	92.2	90.8	90.1	88.0	87.7	86.9	96.9
Ratio of per cent living in each class to per cent living in all classes	100.0	103.0	100.9	99.3	98.6	96.3	96.0	95.1	106.0

Marriages solemnized, 1901–06

Number of couples	1,018,599	106,091	164,915	251,798	176,891	159,721	36,527	87,377	35,279
Children born	2,287,321	179,559	328,308	556,110	402,803	411,649	69,323	248,172	91,402
Children died	315,045	15,214	37,147	71,888	55,577	69,213	11,484	44,746	9,776
Children living	1,972,276	164,345	291,161	484,222	347,226	342,436	57,839	203,426	81,626
Per cent living	86.4	91.5	88.7	87.1	86.2	83.2	83.4	82.0	89.3
Ratio of per cent living in each class to per cent living in all classes	100.0	105.1	102.7	100.8	99.8	96.3	96.5	94.9	103.3

is over 3, while for Class I it is less than 2. But this variation is immaterial, since our purpose is to show the actual contribution to population of the different classes at the date in question. If the ratio itself varied at different dates for the different classes, it might be unreliable; but it does not affect the accuracy of the comparison at any given moment.

(2) Our figures omit widowers, widows, and cases where husband and wife are not enumerated on the same schedule, as well as those omitted by the Census authorities on account of gross and palpable errors. Such omissions would presumably occur more in the case of returns of the lower social classes. Moreover, selective mortality of parents is likely to be greater in these classes, and since the children of widowers and of widows are not included, this may cause an underestimate of their effective fertility. On the other hand, if the frequency of divorce is greater for the upper classes, there may be a certain, though scarcely significant, underestimate of their fertility.

However, the allowance to be made for these factors is not very great and we assume that the last column of Table I gives a fairly close approximation to a true comparison of effective fertility of different social classes. It appears that the upper and the middle classes contribute very much less than their proportion to the increase of population; that, of the working classes, the miners contribute most and the textile workers least; and that, omitting textile workers and miners, the whole class of skilled workers fully holds its own as compared with the less skilled workers. We may conclude that in England at the date of the 1911 Census the charge was substantiated that the population was recruited in proportion to their numbers least from the most successful and well-to-do elements of society; but that there was much less truth in the counterpart of the charge, namely, that the population was recruited most heavily from the least successful and socially lowest elements. These conclusions agree with evidence derived from other sources and from other countries. We must now seek to interpret them in their relation to the future of the population.

If the conditions shown were permanent, they would justify those who maintain that civilization is dysgenic, that social and biological factors are at war, and that the fulfillment of the individual or the group is achieved at the expense of the race. But we must not yield readily to alarmist doctrines so common in the discussion of population. We cannot take one moment in an obviously changing equilibrium and read the whole future in its terms. The situation with which we are concerned has developed since the middle of the nineteenth century. It is part of a process which has certainly not reached its final stage, and must be viewed, therefore, in the light of the whole social trend. The causes of these results are profoundly wrought into the whole character of our civilization. They are still strongly operative and likely to involve more deeply those sections of the population which have hitherto been least affected by them.

The groups least affected have been those which live a relatively self-contained and isolated life within a community. This fact throws light on the population statistics of the miners. It also explains why the country has been less affected than the city, although the rural population does not increase in proportion to its fertility, but instead feeds its surplus into the city so that the fertility of the country is not cumulative. Moreover, the process of urbanization is still advancing, and a larger portion of the total population is being subjected to the influences making for a lower birth-rate. According to the 1920 Census of the United States, the urban population increased from 40 per cent in 1900, to 45.8 per cent in 1910, and to 51.4 per cent in 1920. In Canada, according to the 1921 Census, the urban population increased from 37.5 per cent in 1901, to 45.4 per cent in 1911, and to 49.5 per cent in 1921. In England, already highly urbanized, the urban population, in the decade 1901–11, increased 11.1 per cent as against a rural increase of 10.2 per cent. Technological factors everywhere favor this development, since they allow an ever smaller percentage of the population to provide the raw food materials and other crops required by the whole community. Thus an ever-increasing proportion of the people are brought directly in contact with social forces; and even the country itself is being increasingly influenced by the city. The automobile, the radio, and other agencies are bringing city and country together in spirit. Sociologists agree that, where there is free intercourse between city and country, city ideals dominate.

In other ways, too, there has been continued permeation of common civilizational influences throughout the whole population. Undoubtedly, the restriction of fertility which characterizes our civilization is volitional. It is impossible to explain otherwise the sudden fall of the birth-rate and its correlation with social position. The English *Report* gives abundant evidence that fertility rates are directly and immediately responsive, not so much to economic status, as to the mode of life which is influenced by the type of occupation and by social factors other than wealth or poverty. For example, in the professional class, barristers exhibit a very low fertility and clergymen stand relatively high. Officers of the army and navy have distinctly lower fertilities than authors and schoolmasters.

In other classes, also, there are some remarkable variations, out of all accord with relative economic status, but clearly explicable in terms of mode of life. Thus, domestic indoor workers in Classes III and IV have extremely low fertilities. In Class V navvies and general laborers show the lowest fertilities. This is apparently an effect of occupation, growing out of their lack of a settled abode. Most significant of all is the low fertility of textile workers, the explanation being that textile occupations are shared by both sexes, the wife as well as the husband finding work in the mills. Much other similar evidence might be given. If, then, quite apart from social or economic status, groups adapt their fertility readily to conditions associated with their occupations, it is surely reasonable to conclude that they will also respond to the influences of ideas. From the classes standing highest in prestige or wealth come the influences which radiate throughout the whole community. Civilized man seems peculiarly sensitive to influences which affect fertility, wherever there are no economic barriers to prevent the lower social ranks from following the higher. So, where there is compulsory school education and prohibition of child labor, the economic pressure tends to restrict fertility in the lower as well as in the higher ranks of society.

Effective fertility is a resultant of crude fertility and mortality. Birth-rates and death-rates undoubtedly react on one another, and the lowering of both is a concomitant of what we call civilization. The fall of the birth-rate, however, depends on a cultural condition; while the fall of the death-rate depends on the application of science arising within, but extending beyond, cultural condition. In other words, the fall in the birth-rate is an outcome of human psychology, whereas the fall in the death-rate is a matter of hygiene and sanitation. Preventive medicine in particular is socialized; and its development affects at once, even if not equally, the whole of society. For these reasons, a fall in the death-rate, particularly in child mortality, is likely to precede, in the lower ranks of society, a fall in the birth-rate, and increase their comparative advantage over other classes. But this desirable conservation of child life may prepare the way for influences which make for birth-control. Countries, as well as classes, show the same phenomenon. The death-rate in England, for example, had been falling before the decline in the birth-rate became manifest.

The increasing entry of women into the general economic life is a factor which must also be considered. It is significant that the fertility rates are lower in all ranks of society in those occupational groups where women form a considerable proportion of the total. If the present tendency for the freer entrance of women into the occupations and the professions holds, the results are likely to be reflected in a further and more general lowering of the birth-rate.

Once more the population figures of many countries disclose that adherents of the Roman Catholic religion show a distinctly higher birth-rate than the rest of the population. In Catholic Quebec, for example, the birth-rate per thousand in 1922 was 35.57, as compared with a rate of 24 in Protestant Ontario. (In passing, it is worth noting that the population of Quebec, according to a recent estimate of the Canadian Bureau of Statistics, is not increasing any faster than that of Ontario.) If we compare the Catholic with the non-Catholic countries of Europe, we note that the former maintained a much higher fertility rate than the latter, until the most recent period; but in the last decade the Catholic countries have shown a remarkable and sudden descent toward the level of the Protestant countries. Making allowance for War and post-War disturbances, it seems certain that the general civilizational influences at work are stronger than those of religious tenets. Perhaps the change is to be attributed to a decline in the social control of dogmatic religion — a movement in keeping with the trend of our civilization. The evidence on which this conclusion is based is presented graphically in Figure 9.

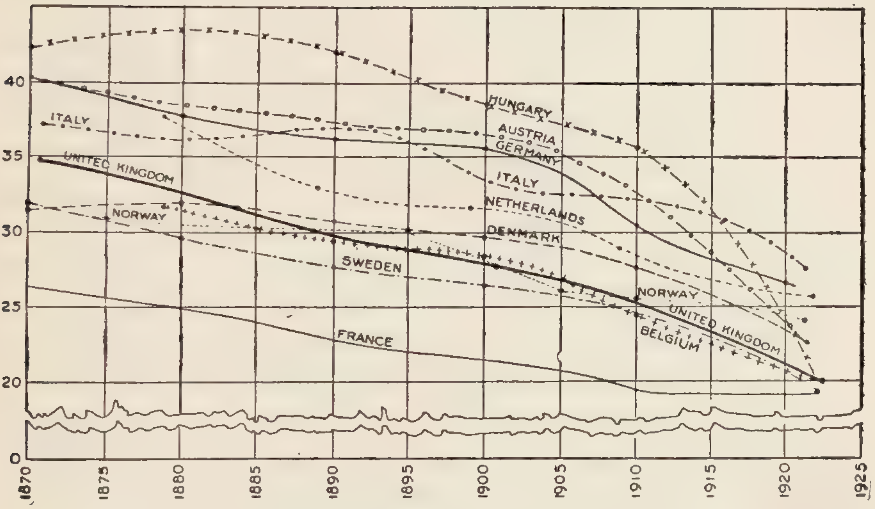

FIGURE 9. DECLINING BIRTH-RATE IN EUROPE

Smoothed curves based on decennial Census enumerations of population and average number of births reported for groups of five years, of which the Census year is the central year. This graph disregards short-time fluctuations due to wars, famines, business cycles, and the like. Post-War figures are for the latest single year available.

As this Figure indicates, during the later periods the range of variation in fertility is far less for European nations as a whole than for the groups of which they are composed. This fact fits in well with our argument; for nations are more closely assimilated within a common civilization than are intranational groups, while the modes of life of the same economic group in different nations are more akin than the modes of life of different economic groups in the same country. The process of democracy, if it continues, will be accompanied by a convergence of fertility rates for social classes not unlike that which has already occurred for whole communities.

Let us consider the prospects of a future equilibrium. We have seen that we are confronted with forces which affect all civilized countries and all classes, but which have hitherto operated so selectively that their continuance might imperil the advance of the civilization which created it. In addition to the decline in fertility noticeable in all classes and the evidence that this movement percolated downward through society from the upper to the lower strata, there has been, during the period covered by the English *Report*, a general retardation of the age of marriage. It is well known that the average age at marriage increases as we pass from the lower to the higher social grades. During the fifty years prior to the Census, retardation of the age of marriage was most marked in the higher social classes, though it has been distinctly operative in all classes. Thus, for marriages of 40 to 50 years' duration, the average age of the wife at marriage in Class I was 23 years, whereas for duration 0 to 5 years it is given as 26.6. The corresponding figures for Class III are 22.1 and 25.1; for Class V, 21.9 and 24.8; for Class VI, 21.8 and 25.1; for Class VII, 21.2 and 23.6; and for Class VIII, 22.2 and 24.8. These figures refer only to marriages in which both husband and wife were alive at the Census date; but the effect of differential mortality can scarcely alter the general result. The progressive retardation is remarkably continuous for all classes throughout the period. The miners and the agricultural workers have been least affected, though it is significant that they have not been untouched by it.

Moreover, we have pointed out that, in the most recent period, social control of the death-rate has reduced this most in the classes where it had been highest, as is brought out in Table II, above. Now the fall in the death-rate may induce conditions favorable also to a fall in the birth-rate, which, however, would be shown only after a time-lag.

Are there, then, definite and assignable limits below which the various rates on which the equilibrium of population depends — such as birth-rate, death-rate, age at marriage, and frequency of marriage — cannot fall? Let us review the existing evidence.

The age of the husband at marriage is obviously far less important, as regards fertility, than that of the wife. Retardation of the age of marriage for males is a factor in the problem only because it makes them more likely to marry older wives. If we turn to the age of wife at marriage, we find that in England during the five-year period preceding the 1911 Census, it averages 25.3. The miners married the youngest brides, averaging 23 years, and Class I the oldest, averaging 26.6. There was a moderate increasing disparity between the classes in the fifty-year period[1] due largely to the almost complete cessation of marriages with women under 20 in the upper and middle classes. At the present time, the disparity is quite a minor factor in the explanation of differential fertility and nothing suggests that it will widen appreciably in the future. Furthermore, the groups which marry latest are those in which the husband is engaged in a profession involving long and expensive training, such as law and medicine. There is little likelihood of any such increase in the length of training as will further delay the period of wage-earning. The age of the wife at marriage is not likely to increase enough to affect the equilibrium of population between social classes.

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[1] See *Fertility of Marriage*, Part II; Table XLVII.

Frequency of marriage for the different social classes is correlated negatively, rather than positively, with fertility. The most fertile classes, according to the English evidence,[1] are also the least married classes. Civilization does not seem prejudicial to marriage itself. The frequency of marriage does not seem to be lessening as compared with past periods, though there is no exact evidence on this point. But the fact that Class I shows a distinctly higher percentage of marriages at the later ages than Classes V, VII, and VIII may be regarded as sufficient evidence that in the future the frequency of marriage will at least retain its present level and will possibly exceed it.

The problem of forecasting the birth-rate is far more difficult. Yet here, too, there are significant indications. Figure 8 shows that the class rates for the shorter marriage duration converge. They diverge again for the last period; but had we taken standardized instead of crude fertility, the rates would have continued to converge.[2] This suggests that the upper and middle classes restrict their fertility seriously only after a certain minimum family is attained. The reproductive instinct is as strong as ever, as regards desire for a family of two or three or four children, though it weakens when that objective is attained. How far the rate will fall, as an average for the whole population, is a question we cannot answer. But we do assert that there is a natural limit. As the upper classes attain it, limiting forces cease for them, though not for the rest of the population. Classes tend to converge just as nations are doing. Many progressive European nations, like the United Kingdom, Sweden, France, and Belgium, seem to be approaching a figure of about 20 per thousand. A like convergence of classes is obviously very desirable. Otherwise the least successful, the least educated, the least intelligent and adaptable will continue to multiply out of proportion; and thereby change, in time, the whole composition of the population, with unhappy and possibly disastrous results. Nor should we trust to the operation of spontaneous social forces which will always be least effective precisely where they are most needed. The same information and guidance in respect to birth-control which is possessed by the educated and the well-to-do should be deliberately provided for those who lack such advantages. Instead, we place political and social bans against its dissemination, encouraging in our well-meaning folly the process of social degeneration. No country is worthy to reap the immense advantage which low mortality and low natality bring unless it has the intelligence to understand attending dangers and the moral courage to control them.

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[1] *Fertility of Marriage*, Part II; Table XXXIV.

[2] *Ibid.*, Diagram XVI.

Finally, let us consider the potential limits to a falling death-rate. There is no reason to suppose that the remarkable decline which has taken place in the last fifty years is yet anywhere near its ultimate goal. In an address before the Harvey Society of New York, on December 16, 1922,[1] Dr. Dublin outlined the possibility of extending human life, which, in view of his special qualifications for making such an estimate, we accept here. He concluded that in the light of our present knowledge and actual achievements, through the further developments of preventive medicine, applied sanitary science, industrial hygiene, the popularization of annual physical examinations and their hygienic follow-up, it is well within human power to reduce the 1910 death-rate as follows:

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[1] Louis I. Dublin, *The Possibility of Extending Human Life*, New York, 1922.

Age	Assumed Reduction from 1910 Rates
0– 5	Approximately two thirds
5–10	Two thirds to one half
10–60	One half
60–70	One half to no reduction
70 and over	No reduction

We here touch upon a very interesting point to which we can give only a few words in conclusion. Our argument has been that the fertility rates of the more prolific classes will approximate those of the less prolific. This implies an approach to a stationary population. In the past, the population of civilizational areas must have been almost stationary. The striking multiplication of the people of Western countries since the end of the eighteenth century was an abnormal phenomenon connected with remarkable social and economic developments. In past ages, the equilibrium of population was mainly determined by the Malthusian limits, the necessities of a limited food supply. The modern rise in the general standard of living has superseded the Malthusian limit, except possibly for the very lowest economic groups. The subsistence limit of existence acts automatically, the standard-of-living limit, volitionally. Moreover, the latter is active in inverse ratio to the former, since it becomes more determinative the farther a class is removed from the subsistence level. Hence the stationary population of the future, if it comes, is likely to represent the position where the birth-rate has fallen to a point where it is just sufficient to compensate for the optimum death-rate.

Let us take the present death-rate in the United States and suppose that the population ceases to be affected by immigration and becomes stationary. Under such conditions what must the birth-rate be in order that the number of persons born each year may be exactly equal to the number dying?

This calculation can be made from the known mortality rates which have been computed for each successive year of life and published in the *United States Life Tables.* In Table II,[1] it is shown that, supposing 100,000 persons to be born each year, and supposing the births to be equally distributed over the year, and further supposing all these persons to be subject to the general mortality rates of 1910, there would eventually arise a stationary population of 5,148,536 persons, including all ages. In this population the number of deaths would also be neither more nor less than 100,000 per year. The birth-rate and the death-rate would thus be equal, and each of them would be 19.42 per thousand. This is the most economical point at which birth- and death-rates could be equalized, failing any reduction of the mortality rates; for a birth-rate of 19.42 per thousand would maintain a stationary population with the minimum number of births which would be necessary to counteract the existing mortality rates. This argument does not, of course, depend on our selecting 100,000 as the annual number of births. We might equally well have taken any other number, or the number x. In any case, we could show in the same way that the combined action of the 1910 mortality rates and a constant number of births would result eventually in the generation of a population which would be so constituted, as regards its total numbers and its age distribution, that both death- and birth-rates would approach 19.42 per thousand.

It is interesting to notice that this number is not far from the rate which has been reached in France. It is also quite within the bounds of possibility that the birth-rate might fall to this point in the United States, and thus one of the conditions necessary to the generation of the stationary population might be set up. The other conditions of our hypothesis were the cessation of migration and the continuance of the 1910 mortality rates.

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[1] *United States Life Tables,* 1921; p. 54.

Now, if we turn to Dr. Dublin's estimate of an optimum death-rate, a similar calculation shows that, given a constant number of 100,000 births per annum, there would eventually arise a stationary population of 6,475,000. In a population of this size, 100,000 births a year would correspond to a crude birth-rate of 15.44 per thousand, and this would also be the crude death-rate. It would be necessary to keep the birth-rate up to 15.44 per thousand to maintain a stationary population, even supposing that the death-rate were cut down to the level suggested by Dr. Dublin.

At this point it is necessary to explain an apparent contradiction between our conclusions and those of Dr. Dublin. He says[1] that if the 1910 mortality rates in the United States could be reduced as he has foreshadowed, the total death-rate would fall from 13 to 8.6 per thousand, assuming there was no change whatever in the age constitution of the present population. It might, therefore, seem necessary under this hypothesis to reduce the birth-rate to 8.6 per thousand in order to halt the natural increase of the population; whereas we have said that a birth-rate of 15.44 per thousand would accomplish the contemplated result. This apparent contradiction is explained by the fact that the age distribution in the United States at present is affected by immigration and by a high birth-rate; but the reduction of the mortality rates to the extent indicated, together with cessation of immigration and the corresponding reduction of the birth-rate, would gradually alter the age distribution of the United States population by increasing the proportion of elderly people.

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[1] Louis I. Dublin, *The Possibility of Extending Human Life*, 1922; p. 23.

The following table shows vividly the change which would take place in the age constitution of the United States if immigration ceased, and the birth-rate were to fall so low that births sufficed only to fill the places vacated by death. At present, 40 per cent of the people of the United States are under 20; under the assumption of a stationary population the percentage would fall to 32.3, or, if Dr. Dublin had his way, to 29. At present, 15.4 per cent of the people are over 50; if Dr. Dublin had his way, this percentage would be doubled. At present, 43.9 per cent of the population are between 20 and 50 years old, potential fathers and mothers (although, of course, some of the older groups would have to be included to cover all the potential parents); with a stationary population this age group would fall to 42.2 per cent, or even to 40.7 per cent with the further reductions in the death-rate, while the proportion of potential fathers and mothers would probably fall 5 per cent if we take into account the number who are to be found among the 'below 20' group.

The extent of this change in age distribution is briefly indicated by the following table:

	Present Population[1]	Stationary Population Present Mortality Rates	Stationary Population Opt. Mort. Rate
Per cent under 20	0.7	32.3	29.0
" " between 20 and 50. .	43.9	42.2	40.7
" " over 50............	15.4	25.4	30.3

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[1] Sources of these figures: present population, *1920 Statistical Abstract, United States of America*, p. 135; stationary population, present mortality rates, *United States Life Tables*, pp. 54–55; stationary population, optimum mortality rates, calculated from Dublin's table, p. 21.

Parenthetically it may be remarked that if Dr. Dublin were able to reduce the death-rate to the degree that he considers possible, by one fell swoop in the course of a single year, such a change would have disastrous consequences. It would mean that nearly a million persons condemned by Nature to disappear from the world during a given year would unexpectedly remain in it. That would be tantamount to dumping a million additional immigrants upon the United States — in fact it would be worse, because many of these survivors would be dependent and elderly, many would be subject to disease, and there would be no immigration inspectors or quota law to keep them out. The effects upon employment, housing, distribution of property, poor rates, and many other social phenomena, would be very serious.

Nobody hopes or fears that the medical men will achieve so rapid a success. But would the gradual attainment of the goal also be disastrous? It would involve real dangers, to meet which would require a greater social intelligence than we now exercise. In particular, education in eugenics would be absolutely necessary, since fewer of the physically unfit would be eliminated at the pre-reproductive ages. Other steps would be to extend the knowledge of birth-control to the lowest social classes, and prevent drastically the reproduction of the feeble-minded and those suffering from certain diseases. If we could assume such a degree of intelligence, the outlook would be propitious. There would be an enormous economy in certain directions, for unnecessary deaths, with all their pre-conditions and consequences, involve a great wastage of resources and of happiness. Those whose life was prolonged to old age would probably enjoy better health during the reproductive period, thus saving millions of working days per annum. Great economies in the cost of education would result, since the funds now devoted to educational activities would not be expended merely in the extension of plant and equipment. Immigration and employment would gradually be so adjusted to the new conditions that there would be no surplus of workers arriving each year and demanding work whether or not the labor market was able to supply it. The annual increase in material wealth, existing normally to-day in civilized countries, would be devoted to improving the standard of living. A gradual reduction of the death-rate contains, therefore, great potentialities of social advance.

But this reduction in the death-rate is not yet an accomplished fact, and it may be a slower and more difficult process than it seems. Meanwhile we do appear to have found that the reduction of the birth-rate to 19.42 per thousand, accompanied by the cessation of immigration, with the continuance of the 1910 death-rate, would be sufficient to produce eventually a stationary population. This reduction of the birth-rate is not improbable, for

(1) In 1920 the birth-rate in the Registration States was only 23.7, which is not much higher than that necessary to produce a stationary population.

(2) This birth-rate was probably unusually high, because of influences connected with demobilization.

(3) Certain communities, such as France, Ireland, and British Columbia, already have a birth-rate very close to the one we have mentioned.

(4) The present age distribution of the United States is abnormally favorable to the multiplication of the species; but, with the restriction of immigration and the fall of the birth-rate and the death-rate, the age distribution will change to something more like that of the stationary population, which is in each case less favorable to

reproduction. Thus, even if the average size of the family remained unchanged, this change in age distribution would lower the crude birth-rate.

(5) All this goes to show that the change needed to stop natural increase, mortality rates remaining constant, would be relatively slight.

THE END

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